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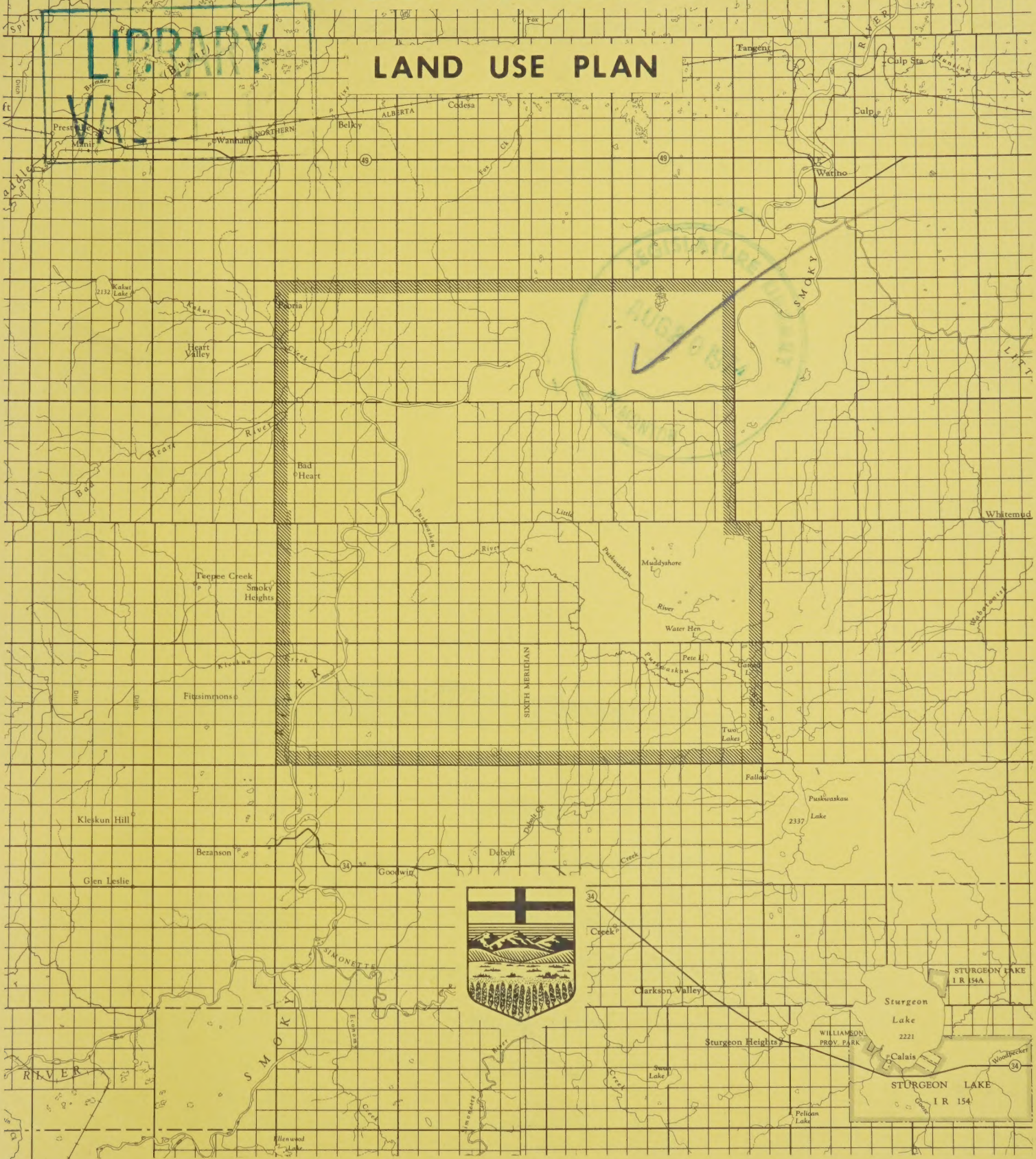


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# PUSKWASKAU

## LAND USE PLAN





## FOREWORD

The Puskwaskau Land Use Study was initiated in June 1969 to determine the extent of suitable agricultural lands and to recommend the best use or combination of uses for all lands in the area. Demand for land for other than agricultural use was increasing, primarily due to the present and projected requirements of the forest industry. North Canadian Forest Industries' plywood plant at Grande Prairie and the at that time proposed pulpmill of Proctor & Gamble expected to receive part of their timber supply from this region.

The preliminary report was completed in the fall of 1969. During 1970 the maps and the contents of the report were subjected to the scrutiny of a large number of people involved in one way or another with the management of renewable resources. These included local civil servants as well as headquarters staff directly engaged in the administration and management of agriculture, forestry, water, recreation and fish and wildlife and those indirectly involved through the supply of services, such as the District Highways Engineer and the Municipal Inspector.

The local population was consulted through their elected representatives in the Valleyview Farm Adjustment Committee.

The Land Use Assignment Committee and the Conservation and Utilization Committee endorsed the plan in the early part of 1971. Ministerial Order 27/71, dated April 23, 1971, authorized the recommended zone changes.

PROVINCE OF ALBERTA



PUSKWASKAU LAND USE PLAN



Prepared by

DEPARTMENT OF LANDS & FORESTS

TECHNICAL DIVISION

LAND USE ASSIGNMENT SECTION

Project Leader

C. Van Waas

April 1971



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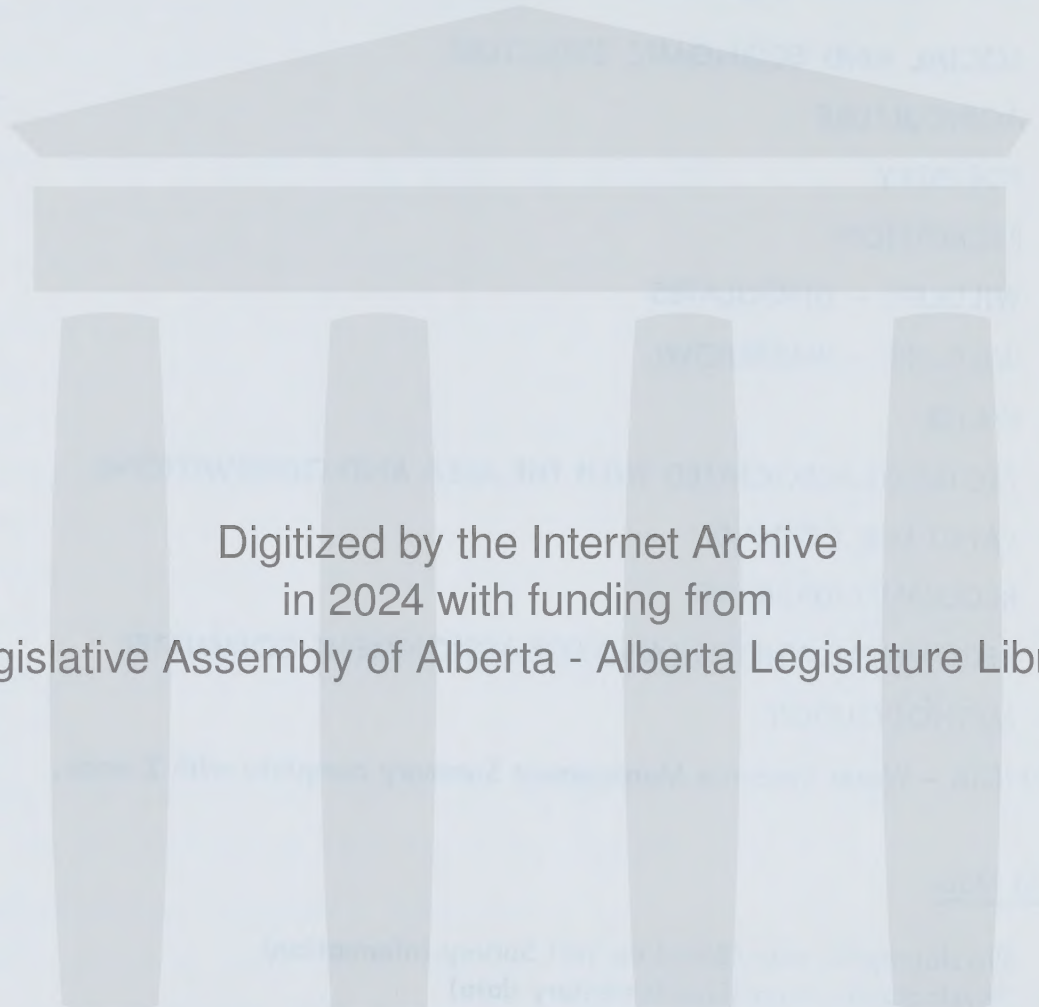
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2. Physiographic map (Supplementary data)
3. Canada Land Inventory - Soil Capability for Agriculture
4. - Land Capability for Forestry
5. - Land Capability for Ungulates
6. - Land Capability for Outdoor Recreation
7. - Land Capability for Waterfowl
8. - Present Land Use Classification (based on 1961 photos)
9. Land Capability Analysis map
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12. Forest - cover map
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14. Land Use Coding map
15. Zoning map
16. Geology map
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## ANALYSIS OF THE STUDY AREA

### A. PHYSIOGRAPHY

#### A-1 Geographic Features

The study area comprising a block of 16 townships, Tp 73 to 76 - R25 and 26 W of 5th Mer. and R1 and 2 W of 6th Mer. is situated in the Peace River Block. Highway 34 (Grande Prairie to Valleyview) comes to within 4 miles of the southern boundary and Highway 49 (Fahler-Spirit River) passes 6 miles north of the northern boundary. The Smoky River traverses the study area in the western and northern parts. No bridge or ferry exists between river crossings on Highway 34 and 49, a distance of 52 miles approximately, as the crow flies. For this reason Debolt supplies the basic necessities for the area, church, school, general store, Esso bulk station, hotel and garage. Grande Prairie, which provides railroad and grain elevator facilities is located 35 miles due West of Debolt (Highway 34). This city supplies all other needs of the district. A number of gravel roads traverse the area. The newly constructed crossing of the Puskwaskau River has extended the road grid to one mile south of the Big Smoky River in Tp 75 - R25 W5. Power and telephone will be brought to this point during the summer of 1969.

The C. L. I. (Canada Land Inventory) present Land Use Map, which was prepared from airphotos taken in 1961, shows no agricultural development North of the Puskwaskau River. However, all available homestead lands, that is, all lands in the 'white zone' have been occupied since then and a fair acreage has been brought under cultivation. Large parts of the 'green zone' in this area are grazed under lease.

#### A-2 Climate

The 'climate' section of Research Council of Alberta, Bulletin No. 60 (Soil Survey of the Grande Prairie and Sturgeon Lake Sheets) is of relevance to the study area. In R. C. A. report 81 (Soil Survey of the Beaverlodge and Blueberry Mountain Sheets) A. C. Carder of the Canada Department of Agriculture, Research Branch, Beaverlodge, Alberta, discusses the climate of the Beaverlodge area.

In his report he states: "Low lying areas may be expected to be more vulnerable to early fall frost than upland areas. Such variations are usually extremely local in nature and are often caused by poor air drainage. Nevertheless, there seem to be extensive tracts of country that are particularly subject to frost, despite the fact that they may be higher in elevation than nearby areas not so affected. The reason for these climatic differences is not clear." This statement reveals the difficulties in predicting frost hazards; however, the above mentioned soil survey report states that low lying areas and organic soils are vulnerable to late spring and early fall frost.

The study area is physiographically comparable to the Grande Prairie area, which has a growing season of 112 days and a frost free period of 95 days. A temperature of 32°F will not damage most farm crops. A killing frost occurs at a temperature of 29°F or lower. The 'cropping season' therefore is considerably



longer than the frost free period. The published sheet Winagami 83N (C. L. I. Soil Capability for Agriculture) shows that the rolling upland areas in Tp 73 R25 and 26 W5 are included in the III Ch climatic zone, the remainder of the study area is mapped as a 2 Ch agro-climatic area. Summer precipitation appears to be critical in the study area. 65% of the total precipitation (Total Beaverlodge 17.57 inches, total Grande Prairie 15.97) falls during the fall, spring and growing season, compared to 80% for the Edmonton area (total precipitation 17.5 inches).

### A-3 Soil Conditions

The study area is covered by Alberta Soil Survey Reports No. 15 and 18. A wealth of information is readily available. The Alberta Soil Zone Map, which is based on soil survey information indicates that the western part of the study area is located in the Dark Grey and Dark Grey Wooded Soil Zone, the remaining area falls in the Grey Wooded Zone.

Solonetzic soils are dominant in the area. Information on the areal extent of soil zones and solonetzic soils is provided. (Map No. 2)

Soil series descriptions of this area indicate saline to weakly saline conditions in the parent materials. As a result, the fine to medium textured soils (lacustrine and lacustro-till) have developed a 'hardpan' condition. (Picture 1a) The till on the upland is only slightly affected.

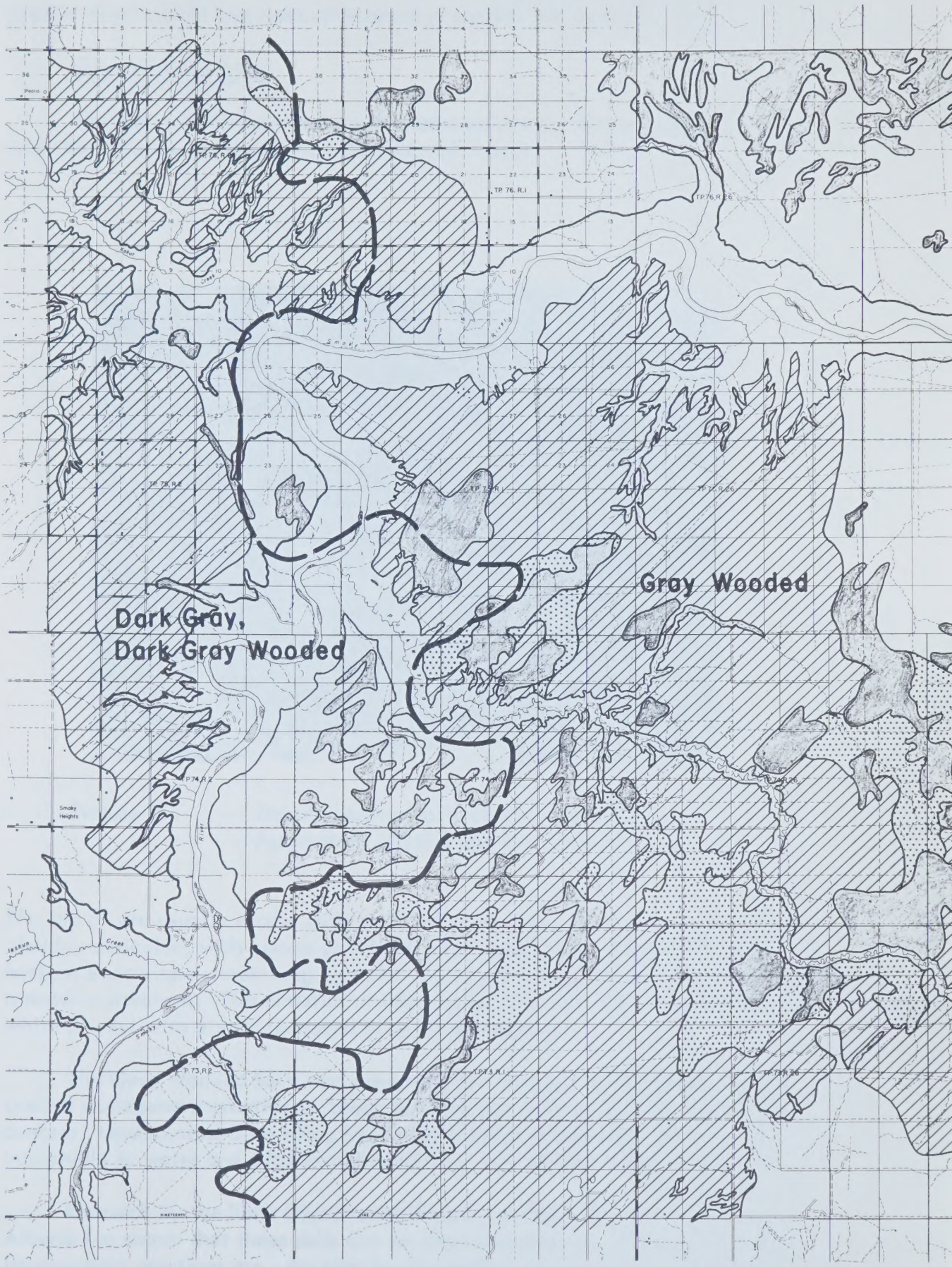


Picture 1a. 'Hardpan' conditions in fine textured soils, NE corner section 35-Tp74-R1-W6 Mer.









Dark Gray,  
Dark Gray Wooded

Gray Wooded

R.2

R.1

R.26

WEST of 6th

WEST of 5th







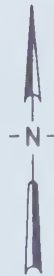


## PUSKWASKAU



### PHYSIOGRAPHIC MAP (supplementary data)

-  Organic soils  
(adapted from C.L.I.map-Forestry)
-  Low Humic Eluviated Gleysols some  
Orthic Humic Gleysols  
(adapted from Alberta Soil Survey Report)
-  Soils developed on Saline parent material  
(adapted from Soil Zones of Alberta-Third edition)
-  Soil Zone boundary  
(adapted from Soil Zones of Alberta-Third edition)



#### NOTE:

This map is comprised of portions of Alberta Base Maps 83-N-N.W./S.W. and 83-M-N.E./S.E.. Therefore all symbolization is standard for Alberta Base Maps



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Technical Division  
Land Use Assignment Section

Study prepared by C. Van Waas

Preliminary \_\_\_\_\_ Finalized ✓







However, the detrimental influence of the saline geological formation on soil profile development was noticed in areas of shallow till over bedrock.

#### Grey Wooded Zone

The shallow till over bedrock is characterized by deeply leached profiles with Ae horizons developed to a thickness of 8 to 10". (Picture 1b)



Picture 1b. Deeply leached soils (9-10"), typical for Agriculture ARDA Class 4 in the study area.

The top 6" are usually coarse platy with some mottling, the remaining 3 to 4" is cloddy, vesicular, with numerous mottles (iron oxidation). The impervious Bt horizon encourages water-logging in the lower part of the Ae horizon, creating a massive structure. This material crushes easily when dry into a light grey to white powder with a very fine sand to silt loam texture.

The Grey Wooded Soils and especially the deeply leached ones require special management practices. These soils are low in organic matter (humus) content, tend to crust after rain, have a poor water infiltration rate, are vulnerable to water and wind erosion and have poor water holding capacity.

Research by the Soils Department, Faculty of Agriculture, University of Alberta has shown that these soils can be improved greatly. The advocated soil improvement practices are crop rotation (including nitrogen fixing legumes), heavy manure and commercial fertilizer applications. These recommendations



cannot always be adhered to by homesteaders, who have invested all their capital in clearing and breaking. Cash crops are needed and grown without rotation, aggravating the undesirable qualities of Grey Wooded Soils.

During field checking in the last week of June, it was observed that the Ae horizon was very dry and that reserve moisture in the B horizon was low.

#### Dark Grey and Dark Grey Wooded Zone

The management limitations of the Dark Grey Soils are less severe. Contributing factors are: higher humus content in the Ah horizon, better water infiltration rate, better structure and higher fertility.

The eastern extremes of the Saddle Hills are part of the study area. These hills are characterized by residual soils and shallow till over residual soils with strongly developed hardpans. Shallow Ah and Ahe horizons over the Bt horizon combined with long, even slopes, create severe erosion hazards. The presence of alluvial soils on the lower slopes may indicate severe slopewash in the past.

A. C. Carder of the C. D. A., Research Branch, Beaverlodge, writes in his climate appendix to Soil Survey Report No. 20:

'Much of the winter's snow water is lost by spring run-off. This is doubly unfortunate since beside loss of moisture, considerable damage by sheet erosion and gulleying may be done to cultivated fields. This condition is aggravated in much of the Peace River Region by the clayey nature of the soils and the shallow depth to hardpan.

#### A-4 Topographic Features

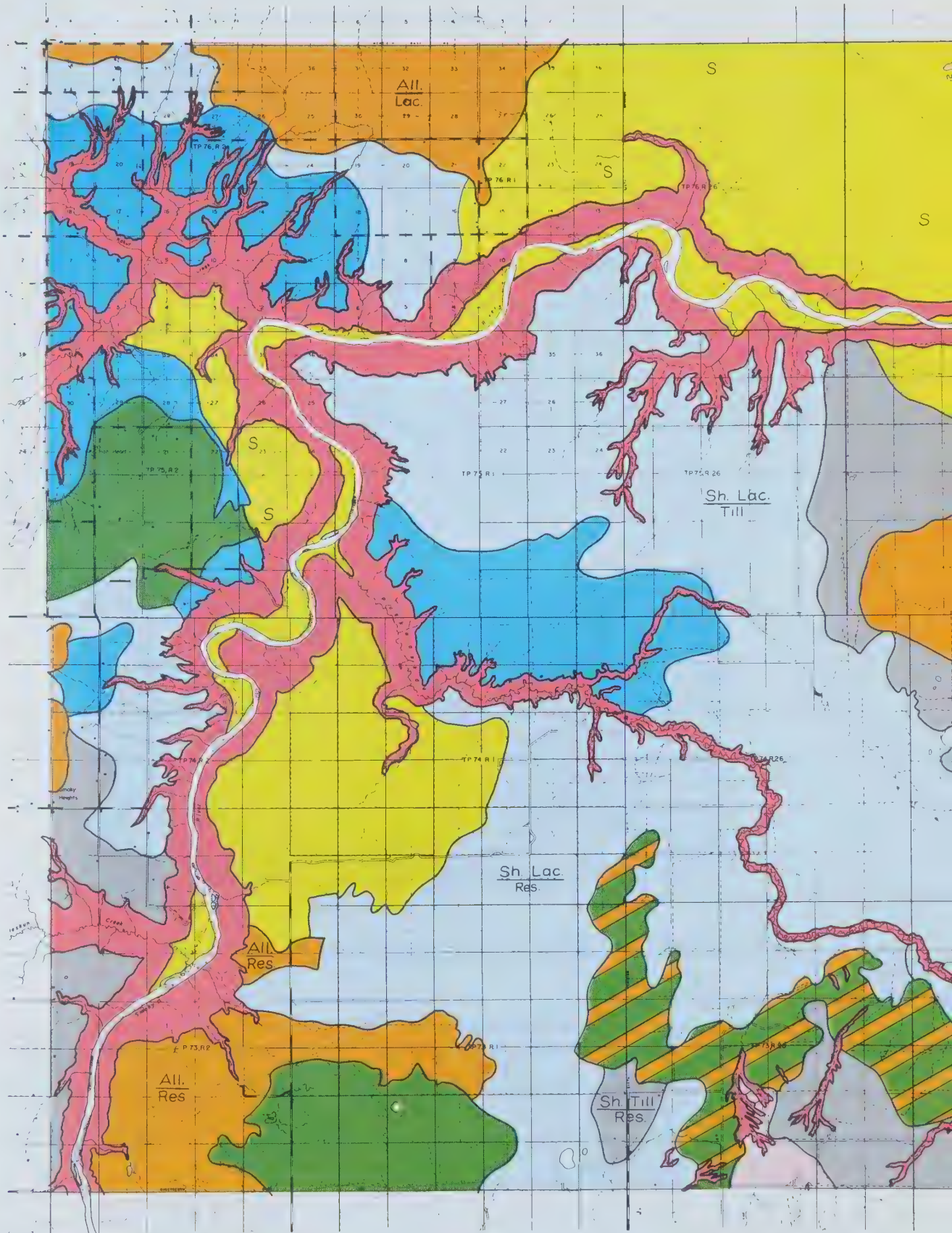
The study area is dominated by the Smoky River and its tributaries, Kleskun and Kakut Creek and Puskwaskau River. The width of the Smoky Valley varies from 1 to 3 miles and the present river bed lies 500 feet below the surrounding plain. The river rises in the Mount Robson icefields (Continental divide) and maintains a steady flow during the summer months.

During the waning stages of the Cordilleran glaciation the river deposited large quantities of sand and silt and built an extensive delta in glacial Lake Peace. Part of this delta is located in Tp 76, R25 and 26. The delta shows the action of wind erosion. The resulting sand dunes have since been stabilized. Glaciation and post-glacial erosion have left their marks on the landscape. Large areas of residual material are the result of the abrasive effect of glacier advance over the uplands and through the valley. Deposition during deglaciation was scanty or non-existent. Residual soils and soils under the influence of saline residual material close to the surface are common.

The light textured floodplain and deltaic deposits are not influenced by bedrock.







R.2

R.1

R.26

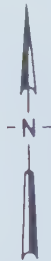
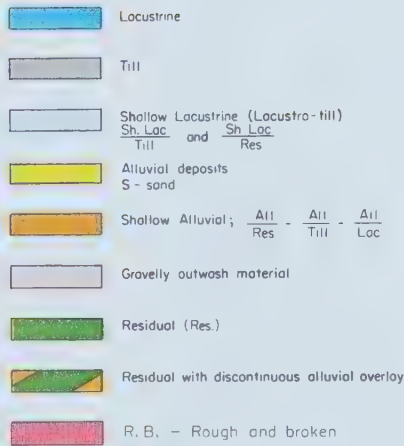
WEST of 6th

WEST of 5th

# PUSKWASKAU



## PHYSIOGRAPHIC MAP



### NOTE:

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TP.73

Information derived from Alberta Soil Survey Reports No. 15 and 18.



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Technical Division  
Land Use Assignment Section

Study prepared by *C. Van Waas*

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Pictures 3 & 4. Road-cut and ditch in unconsolidated bedrock material.  
(Debolt soil series) East side section 24-Tp73-R1-W6 Mer.

#### A-5 Natural Vegetation

The study area lies in the mixedwood section of the Boreal Forest Region. The characteristic forest association of the well drained uplands is, as the name implies, a mixture in varying proportions of aspen, balsam poplar, white spruce, birch and balsam fir.

Aspen were found on the heavy textured moderately well drained soils in the basin. Areas with impeded drainage are occupied by a mixture of willow, alder and black spruce, while black spruce and tamarack are dominant in the organic areas.

The alluvial soils carry an aspen vegetation with young spruce undergrowth. Pine is restricted to the very sandy soils.

The density of undergrowth, like Alberta Rose, alder, highbush cranberry, ferns and grasses is related to the available moisture in the forest. Ecological optimum of undergrowth appears to be related to age, species composition, and density of the forest stand.

Intermediate and mature forest stands were found on the upland-till and residual areas. Fire history is responsible for this pattern, however, periodic flooding and impeded drainage in the basin may also be partly responsible for this pattern. (Map 12 - Forest Cover Map)

## B - SOCIAL AND ECONOMIC STRUCTURE

The hamlet of Debolt acts as the social centre for the study area East and South of the Smoky. One small United church and one small beer parlor is all that is available to slake the spiritual and physical thirst of a rapidly expanding population. A curling rink and a recently completed '1967 Centennial Project' community hall enhance the cultural life of the community.

The 'Edson Trail' school on the highway at Debolt has added 2 portable units and caters to 125 students in grades 1 and 2. All other students of the district are taken to the 'Rich Valley' school at Crooked Creek, 8 miles east of Debolt. This is a 16 room school which has an enrolment at present of 335 students in grades 3 to 12 inclusive. The Rich Valley School wants to expand; however, growth in student numbers attributable to the newly developed homestead area north of Debolt was smaller than expected and expansion plans were subsequently tabled by the school district.

The wheat sales to the U.S.S.R. and Communist China during 1963-1964 stimulated the development of the remaining arable soils in the 'white zone' of the study area.

Piecemeal clearing, typical for new homestead areas is lacking, a minimum of 50 to 100 acres clearing and breaking is the rule. (See picture 5)



Picture 5. Burning windrows in new clearing in NE 31-Tp74-R26 W5 Mer. June 1969, (Eslinger brothers)



Economics in bringing in clearing equipment to this remote area and homestead (lease) loans play a major role in this type of development. Buildings (living-quarters) are sporadic.

The Macklin brothers charge \$55. an acre for clearing, breaking and seeding the first crop. Other farmers claim that they have spent up to \$50. an acre when the first crop is sown. In areas of heavier timber (See picture 6) in Tp 73 R26, a price of \$65. to \$70. for clearing and piling was quoted by Ted Gerwatosky, a long-time resident farmer of the Debolt area.



Picture 6. Clearing in the boreal forest. The crawler-tractor blade in foreground gives indication of size of timber.

A well developed farm unit in Tp 75-26-Section 5 ( See picture 7) belongs to a construction company from Grande Prairie. The outlay and quality of the buildings must be the envy of many farmers in the district. The farm is operated by a foreman.



Picture 7. The 'dream' farm. Owned by Hackwell Construction of Grande Prairie. East half section 5-Tp75-R26 W of 5 Mer.

Ground water for domestic use is hard to find and usually, if found, is of poor quality. Farmers and stock are dependent on dugouts. Many bring in water for domestic consumption from the hamlets. (Debolt, etc.)

The land development investment in newly opened homestead areas is extensive. Returns on the investment are not always realized during the first years of development. Farm income is augmented by endeavours such as custom clearing, winterwork in oil and lumber industry, trap lines, etc. Several new homesteaders commute every day to Grande Prairie, a return trip of approximately 100 miles, others come home twice a week. If it is assumed that \$50,000 farm capital is necessary to operate a viable unit, these people will be commuting for the remainder of their lives.

In the recently opened homestead district, north of the Puskwaskau River, all homesteaders were grouped as to place of domicile, age and occupation at time of application. This small study was made in order to get a better understanding of the social structure of the area. A map was prepared, showing size of farm, according to homestead applications. Known husband and wife applications were combined. Field work proved that this map showed only part of the picture. Individual homestead sales are combined into family holdings and farmed as a unit. Subsequently, known holdings operating as a unit, were superimposed. E-Eslinger, M-Macklin, N-Nordmark, V-Milligen, D-Dyck. (Map 11)



The following table was prepared, giving 'place of domicile' and 'average age'.

|                              | <u>Number</u> | <u>Average age at application time</u> |
|------------------------------|---------------|--|
| Grande Prairie & District    | 29            | 34 (18 over 30 years)                  |
| Local                        | 25            | 30 (10 over 30 years)                  |
| Outside Peace River District | 18            | 38 (12 over 30 years)                  |

Administrative information and fieldwork showed that:

- a) Out of a total of 72 land dispositions, homestead sales accounted for 63, and homestead leases only 9.
- b) Close to half the homestead land was acquired by people from G.P. and district.
- c) The second largest and youngest group is made up of local people, who seized the opportunity to start on their own, with backing of the established home farm.
- d) The G.P. group has a fair percentage of settlers above the age of 30. At application time their profession was given as truck driver, cat operator, carpenter, warehouseman, student, farmer, etc.
- e) The third group encompasses some farmers who relocated and came in with capital and machinery. They clear and break land on a large scale (See picture 5), acquire as much land as possible (Eslinger brothers) and may, under normal circumstances, succeed with their enterprise.

All groups have gone to the limit of their resources to bring virgin land under cultivation. As usual, the actual cost per acre proved to be higher than the estimated cost. A rebate per acre for land brought under cultivation was suggested by one of the farmers.

Soil Survey Report No. 18 published in 1956, states that grain farming is the prevalent type of farming in this area. This is repeated in Report No. 20 (Beaverlodge-Blueberry Mountain). The increase in acreage sown to hay crops as indicated in the 1951 and 1956 census years is considered very desirable for the region, according to this report.

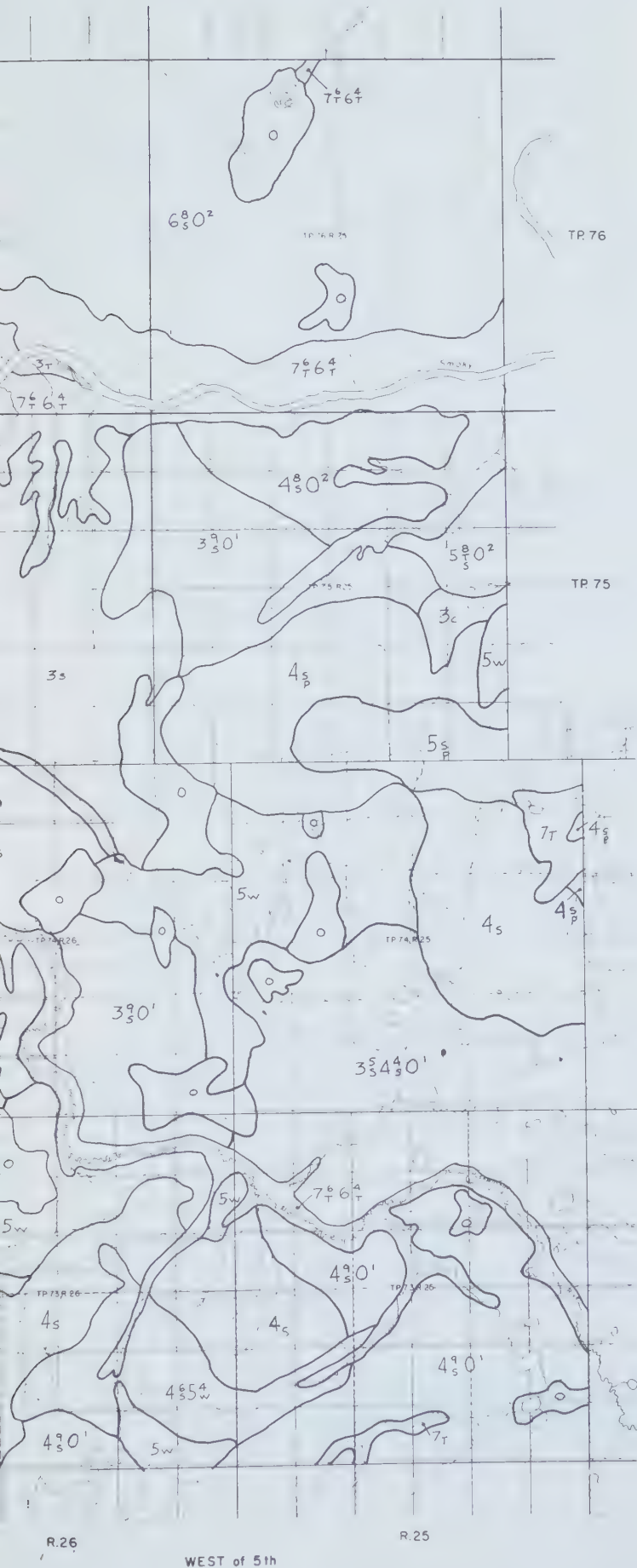
The study area is dominated by Class 3 Agriculture C. L. I. soils (approximately 40%). Small areas of Class 2, in combination with Class 3 are mapped. (approximately 5%). The remaining 55% of the area, in order of dominance, falls in the following classes 7-4-6-5.

It is generally understood that in the Agriculture C. L. I. classification the first 4 classes are suitable for sustained agriculture, Class 5 for improved pasture and Class 6 for unimproved pasture.







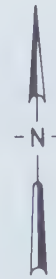


# PUSKWASKAU



## CANADA LAND INVENTORY

### SOIL CAPABILITY FOR AGRICULTURE



#### NOTE:

This map is comprised of portions of Alberta Base Maps 83-N-N.W./S.W. and 83-M-N.E./S.E.. Therefore all symbolization is standard for Alberta Base Maps





## C - AGRICULTURE

Grain farming is the prevalent type of farming in the study area. Wheat, oats and barley occupy by far the largest proportion of the cultivated land. Wheat is generally the dominant grain grown but in some years the acreage sown to oats exceeds that sown to wheat. Acreage sown to hay crops is on the increase. (This includes clover, alfalfa and cultivated grasses) In addition flax, rye and rapeseed are grown, the latter commanding increasing attention in recent years.

From available records it is estimated that the average yields are as follows: wheat about 22 bushels per acre, barley about 27 and oats 38. These estimates include yields produced on many soil types and under many different types of farm practice. The livestock population is comparatively small and did not grow proportionally with increased number of acres under cultivation. 1/

C. L. I. agriculture capability Classes 2 to 7 are found in the study area. Class 2, 3, and 4 are mainly devoted to the growing of grain, however, the latter has the higher concentration of mixed-farming enterprises. Some Class 5 areas, usually shallow organic soils, have been brought under cultivation. These soils are cold soils susceptible to frost and grain crops will mature slowly.

The Class 4 group contains the following soils:

- 1) Grey Wooded Solonetz to solodic soils
  - (a) poor internal drainage, hardpan, low fertility
  - (b) deeply leached soils in profiles developed on residual material
- 2) Grey Wooded Sands and Silts (excessive drainage, low fertility)
- 3) Grey Wooded Tills with sandy overlays or adverse topography (low fertility and vulnerability to water and wind erosion)

Soils of this nature could be partially utilized in a mixed farming enterprise. Lack of good water has stagnated the growth towards mixed farming, placing the agricultural value of Class 4 lands in jeopardy.

The existing erosion problems as a) proximity to Smoky Valley, b) residual soils and bedrock influenced soils and c) light textured alluvial soils (Culp-Leith-Peoria), can be greatly reduced by cultivation practices. Conservation practices are: a) grassing-in headwaters of creeks, b) discontinuation of summer fallow and c) cultivation instead of plowing or disking.

## D - FORESTRY

The tree-cover in the lacustrine basin is predominantly aspen. At present the tree size is small, and the diameter 2 - 6". There is a definite absence of spruce. The till and residual soils, with their deeply leached Ae horizons (7 - 10") carry a mixed forest of aspen, black poplar, spruce and alder.



"It was found that the best forest growth (M. A. I. 91-110 cubic feet per acre per year; Capability Class 2) is associated with moderately well drained, sandy clay loam till sites on upper north facing slopes. Some of these sites have a thin overlay of water-deposited sandy loam. Class 3 lands for forestry were found on the lower south facing slopes on till capped by aeolian sand." <sup>2/</sup> In the light of this information we may assume, that Class 3 for forestry does occur in areas of alluvial over till and Class 4 in areas of alluvial over residual material. The C. L. I. Forestry inventory mapped these areas respectively 4 and 5. A coniferous seed source is available on the residual and till soils. Regeneration of spruce is fair to very good.

Tp 73, R25 and part of R26 are included in the North Canadian Forest Industries Ltd. lease area. The remaining green zone area is a Provisional Reserve for the proposed Proctor & Gamble Pulpmill. Large areas of the green zone (forested area) are under grazing lease. Compatibility between optimum forest growth and grazing in the forest will be discussed later.

Scattered quarter sections within areas under cultivation should be preserved under native vegetation. This will combat total denuding of the area, aid wildlife and grazing and improve the esthetic beauty of the landscape.

Recommendations to this effect will be made.

A map showing location, type of forest (hardwoods, mixed and softwoods) and height class is supplied with the report. It will be observed that the areas of light tree cover were brought under cultivation. In this instance it is fortunate that the light cover coincided with the better agricultural soils. However, the 'light cover-good soil' areas have been taken out and expansion takes place in inferior agricultural soil with medium to heavy tree cover. (See picture 8)



Picture 8. Clearing in medium to heavy mixed forest. The spruce are utilized by the homesteader.

1



36



25



24



13



12



10



38



26



26



26



26



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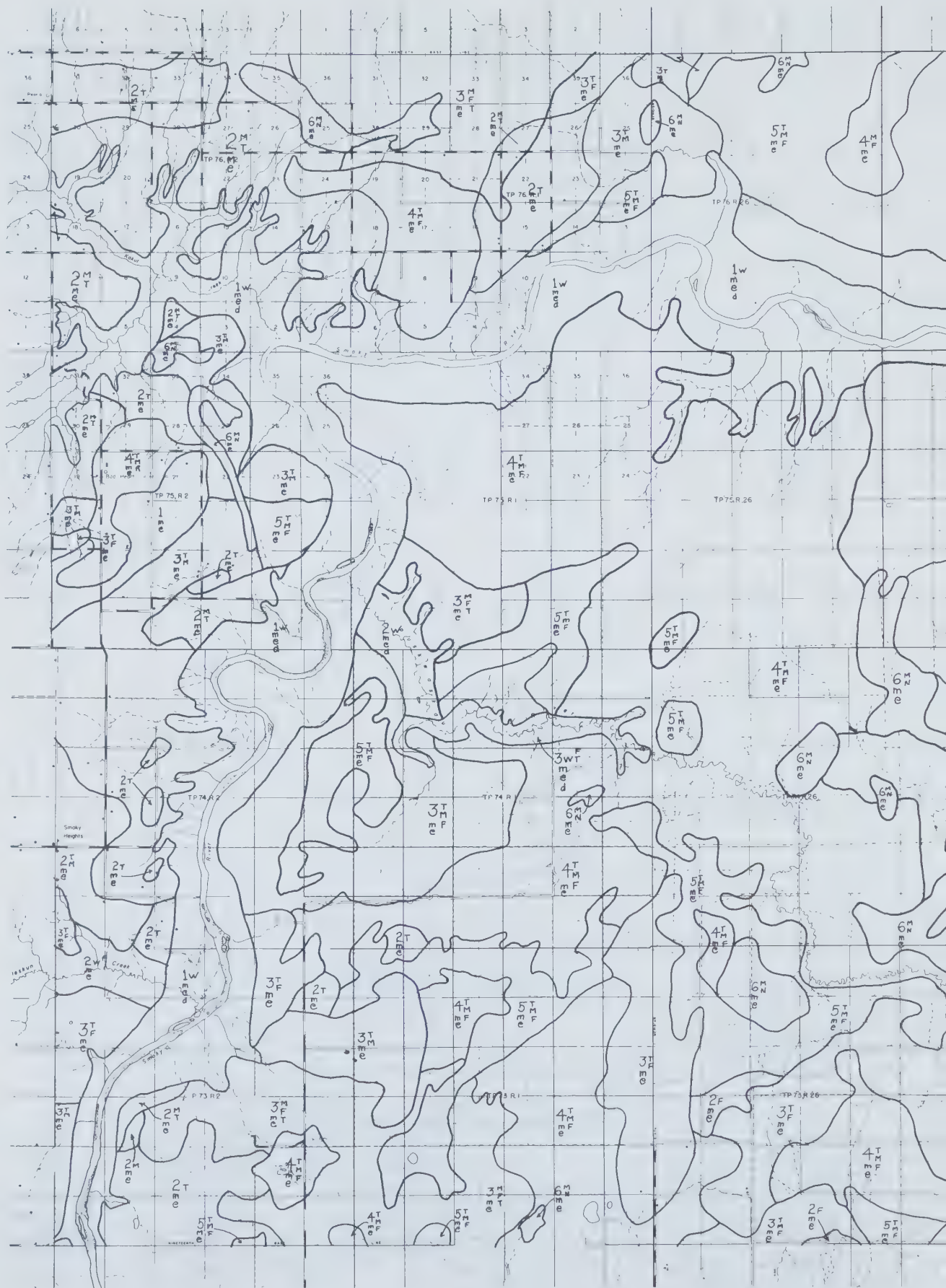
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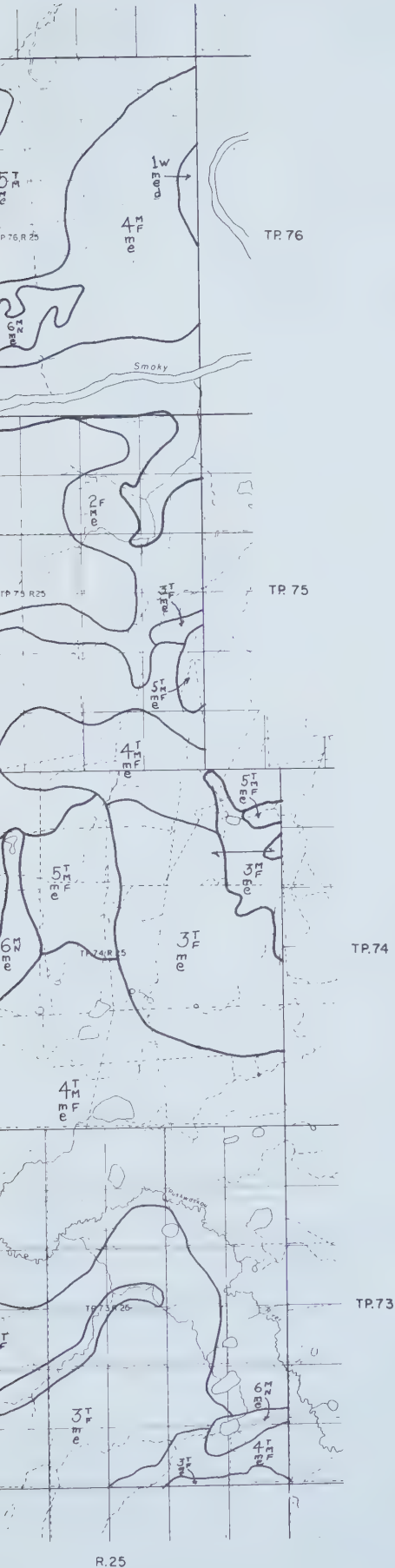
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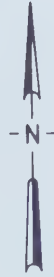


# PUSKWASKAU



## CANADA LAND INVENTORY

# LAND CAPABILITY FOR UNGULATES



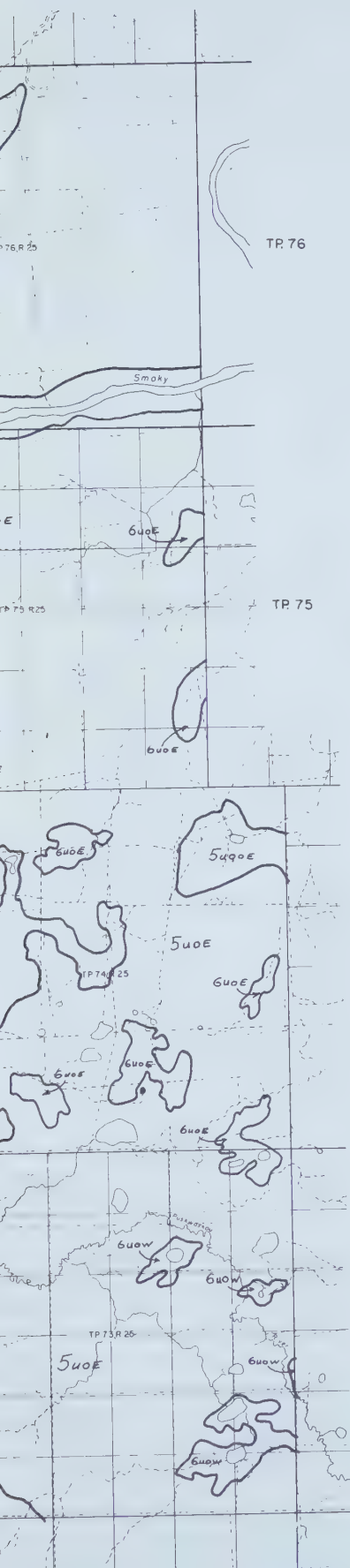
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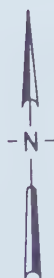


# PUSKWASKAU



## CANADA LAND INVENTORY

### LAND CAPABILITY FOR OUTDOOR RECREATION



#### NOTE:

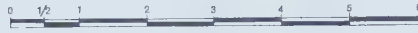
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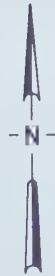


# PUSKWASKAU



## CANADA LAND INVENTORY

### LAND CAPABILITY FOR WATERFOWL



#### NOTE:

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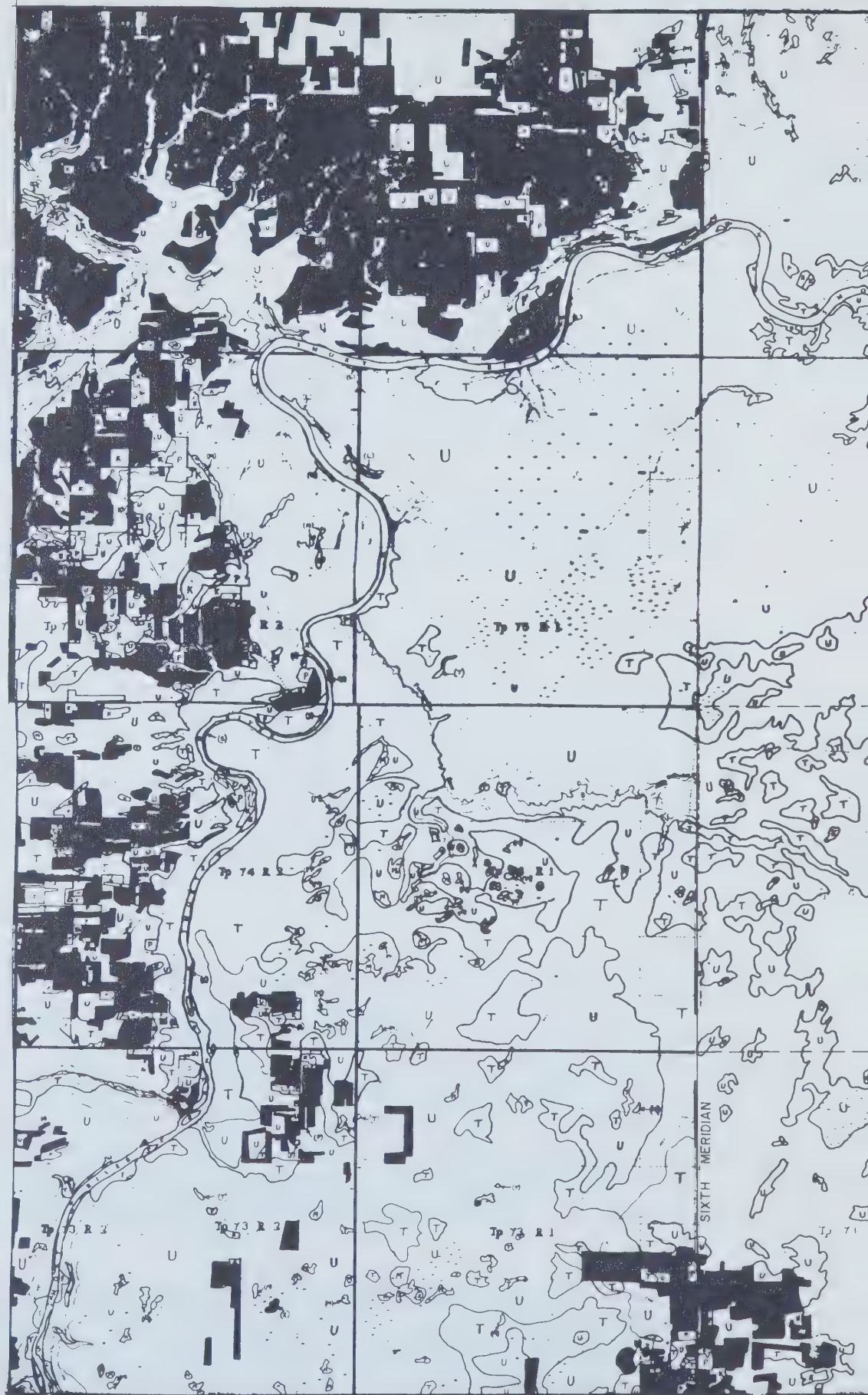


Tp. 76

Tp. 75

Tp. 74

Tp. 73



R. 2

R. 1

W. 6th MER.

R.

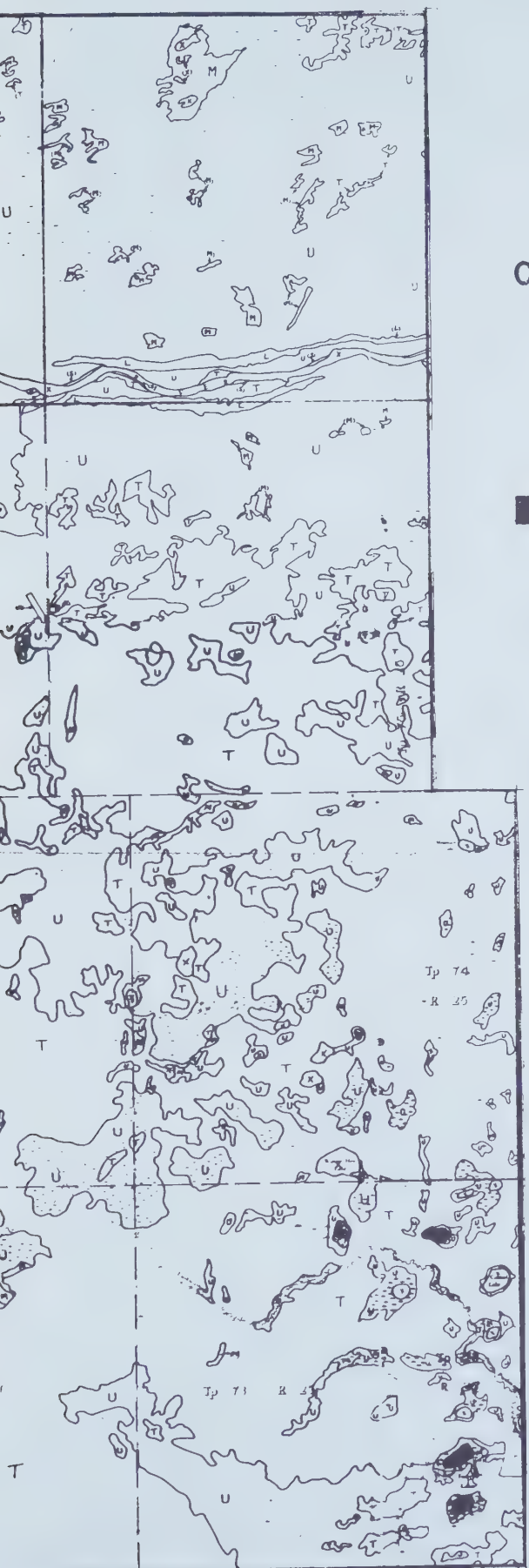
# PUSKWASKAU

## CANADA LAND INVENTORY

### PRESENT LAND USE

 Lands used for annual field crops

(1961)



R. 25

W. 5th MER.





## E - RECREATION

The recreational potential, according to the C. L. I. inventory is moderate to low, Classes 4 - 5 and 6. The Smoky Valley has areas of Class 4 - moderate potential, with sub-classes K - organized camping, L - landforms, O - upland wildlife, and Y - family boating.

At present no development of potential has taken place.

## F - WILDLIFE - UNGULATES

During a helicopter traverse in the last week of June 1969, five moose were spotted in the upland area. The C. L. I. inventory map shows large areas with very slight and moderate limitations for the production of moose and elk. The Valley of the Smoky is rated as Class 1 winter range. It is suggested that the Valley should be reserved for wildlife and recreation.

Improved pasture on the upland grazing leases and scattered unimproved quarter sections on marginal soils will increase grazing capacity for domestic cattle and provide summer range for ungulates.

## G - WILDLIFE - WATERFOWL

Ratings of 6 and 7 for this use are dominant in the study area. Some 4 and 5 class areas are mapped in Tp 74, R25; Tp 74, R1; and Tp 76, R25 and 26. The latter has an area of approximately 1-1/2 sections (Tp 76 R25-28, 29, 32 and 33) which is rated Class 2. The crown granted Ducks Unlimited an easement on this area. A dam will be constructed in order to raise the waterfowl potential of this area. The unit is poorly drained, has large areas of sedge and is part of the Four Mile Creek Stock Improvement Association.

## H - WATER

There are three main tributaries to the Smoky River in the study area - Kukut and Kleskun Creek West of the Smoky and the Puskwaskau River to the East. The valleys of these creeks and the river are young and still in the down-cutting stage. They carry a great volume of silt-laden run-off during the spring, rendering the water unsuitable for domestic use. After the spring turbulence has subsided, local farmers utilize the creek water for domestic use. During the second half of the summer the creeks go dry and the farmers go back to their dugouts, or bring in water from community wells in the hamlets. For example, farmers North of Debolt and even North of the Puskwaskau River obtain their drinking water from the community well in Debolt.

The cost of deep drilling for a domestic water supply is prohibitive in many areas of the Peace River region. The standard water supply for every farm is the dugout. In 1961, the PFRA extended its program of financial support for the construction of dugouts into the Peace River block. They prescribed a standard size dugout, 14 feet



deep (to maintain a good supply of water under the ice during the winter months) and surface dimensions of 70 x 200 feet. The excavation is approximately 4265 cubic yards and the basin has a capacity of 720,000 gallons. At the moment PFRA assists with 7 cents a yard after the first 2000 yards, up to a maximum of \$150.00. Mr. Stu Shields of PFRA quotes a construction price of 15 cents per yard. Construction cost for the above mentioned dugout will be \$600. approximately.

The reluctance of most Peace River farmers towards mixed farming is partly attributable to a shortage in water supply.

Jones, in Research Council of Alberta Bulletin 16 (Groundwater Resources, Peace River District) quotes water consumption of domestic stock as follows: 25 to 35 igpd (imperial gallons per day) for each milk-producing cow, 12 for each steer or dry cow, 10 for each horse, 2 for each hog, and 1-1/2 for each sheep. Assuming an average consumption of 20 igpd per animal in a cattle herd, the total yearly consumption for a herd of 100 head will be 730,000 gallons. During the winter months the capacity of the basin is greatly reduced, due to ice, which may reach a thickness of 36 inches, and of course, no replenishing takes place in the winter months. A certain amount of seepage does occur.

A minimum of 50 acres is needed to keep a dugout of the described size replenished. This area should not be contaminated by cattle or from other sources. In order to increase water supply, for a cattle orientated farm enterprise, larger drainage areas are required. This undoubtedly will interfere with easyness of operation. Water should be close to the cattle, but cattle will contaminate the recharge area.

Many farmers have overextended their credit and are, at present, not in a position to change their farm enterprise towards mixed farming, although many are working in this direction.

## I - PROBLEMS ASSOCIATED WITH THE AREA AND OBSERVATIONS

1. The small creeks close to the Smoky Valley are a potential erosion hazard. Damage by spring run-off and electric storms can be partially controlled by leaving the headwaters under forest. Most soils in the lacustrine basin are Class 3 and 2 C. L. I. - Agriculture and will be fully utilized in the near future.

2. Heavy tree cover renders clearing uneconomic, especially in Class 4 agricultural soils.

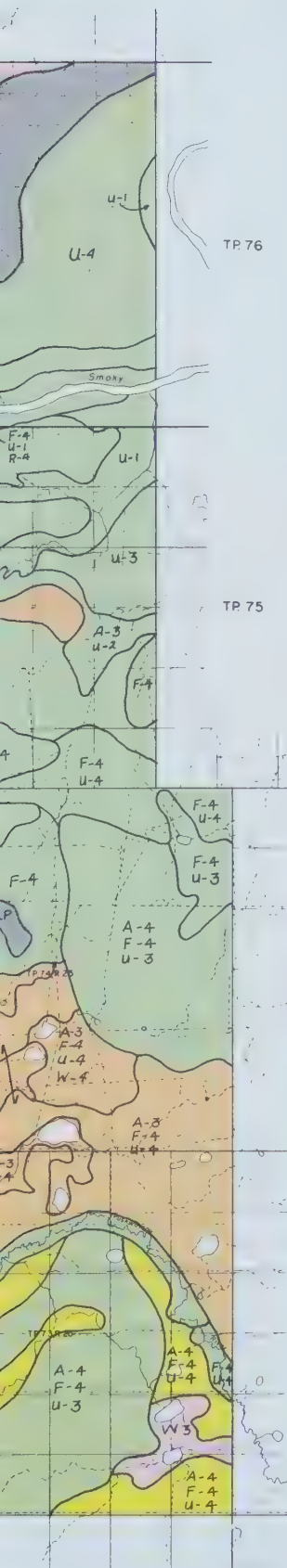
3. The better agricultural areas were settled by the early homesteaders. The second and third wave of development took and takes place in second and third quality areas. These areas require higher capital input and superior management skill in order to compete with the more fertile areas.

4. Some of the parkland, which developed on the saline shales, and meadow areas with associated light cover, have been brought under cultivation. Clearing cost considerations have enticed homesteaders to bring these areas under cultivation. (Tp 75-R2 and Tp 75-R1)
















## PUSKWASKAU



### LAND ANALYSIS MAP

(ARDA classes)

-  AGRICULTURE (A) Classes 2 - 3 - 4
-  FORESTRY (F) Classes 3 - 4
-  UNGULATES (U) Classes 1 - 2 - 3 - 4
-  RECREATION (R) Class 4
-  WATERFOWL (W) Classes 2 - 3 - 4
-  LP LOW POTENTIAL LAND for all uses
-  ALTERNATE USE POSSIBILITIES

Map color indicates dominant class

#### NOTE:

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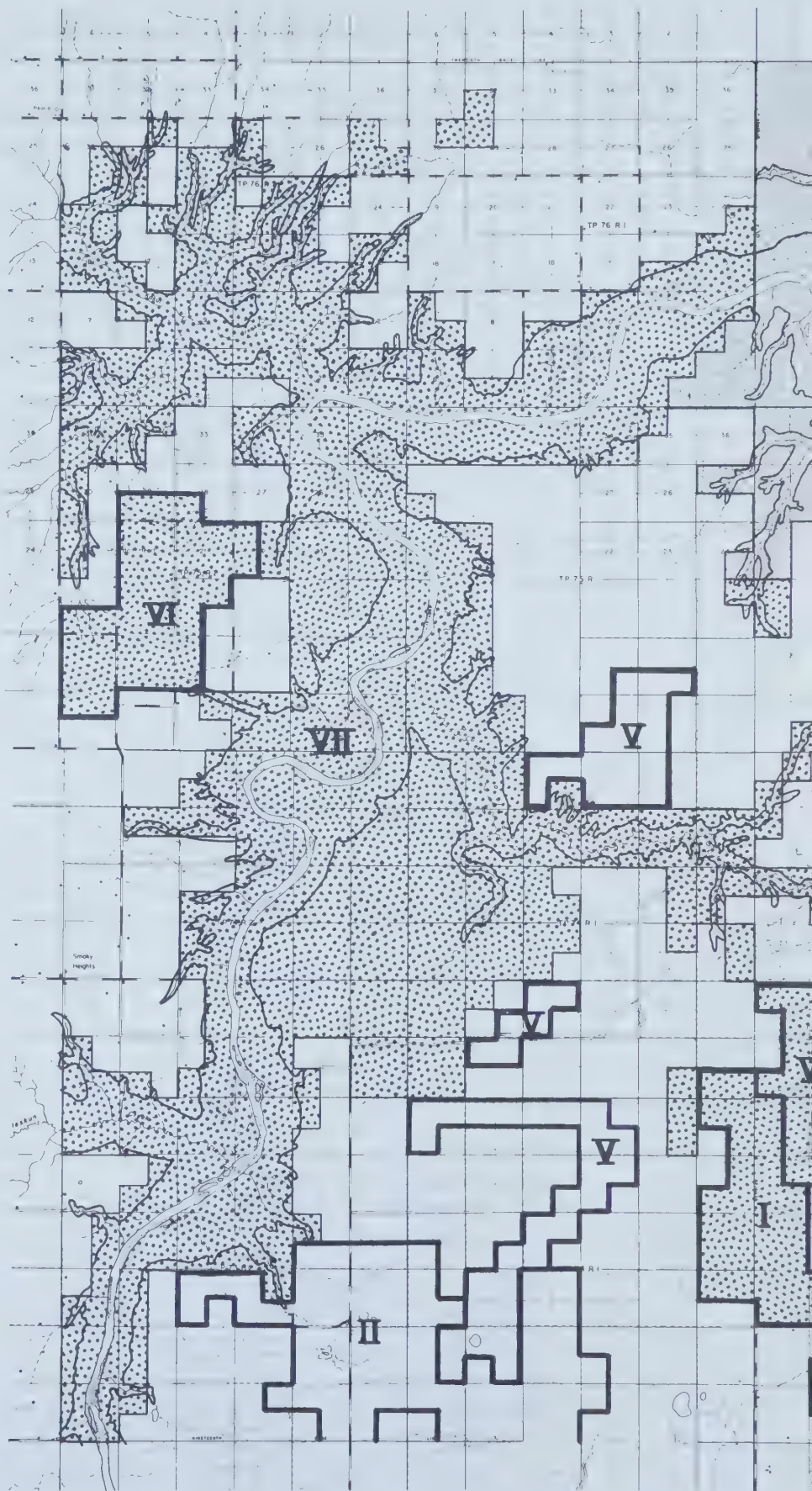
Study prepared by... *C. Van Waas*

Preliminary..... Finalized... ☒





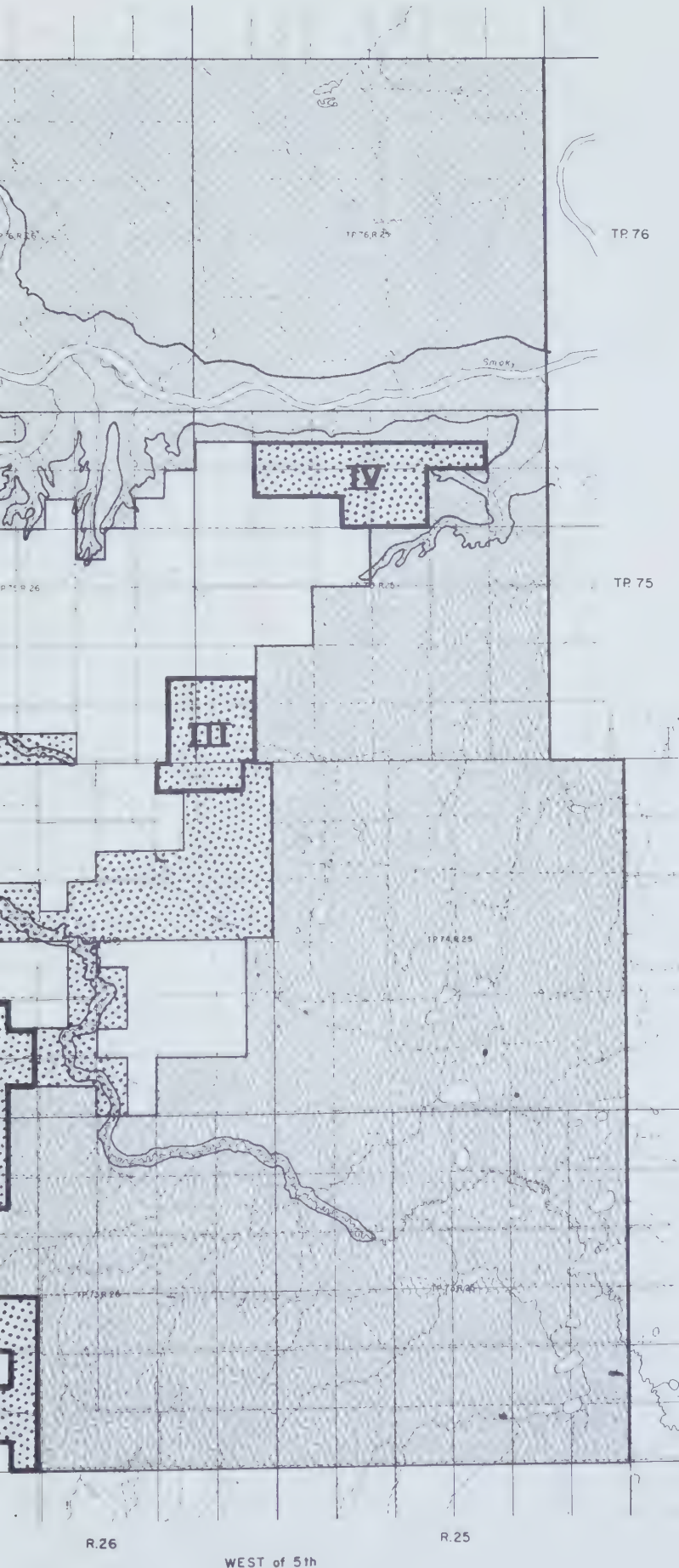




R.2

WEST of 6th

R.1



## PUSKWASKAU



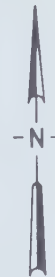
### PROBLEM AREAS

YELLOW ZONE

CONSERVATION LANDS

GREEN ZONE

PROBLEM AREAS



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TP.73



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R.26

WEST of 5th

R.25





5. Dependence on dugouts for domestic and farm water supply restricts the development towards mixed farming. P. F. R. A. is gradually cutting down their cost sharing program.

6. The present mode of grazing and grazing lease development on Crown Land is inadequate.

The North Goodwin Stock Improvement Association holds grazing lease 37318, encompassing a large portion to Tp 74-R1 and 2, a total of 11,867.35 acres. This area is mapped as Class 3 C. L. I. Agriculture, the soils are of deltaic origin. They are sandy, with a sometimes choppy topography with numerous small sloughs, creating a pattern not well suited to agricultural development.

The following problem areas are marked on the Land Zoning Map.

Problem areas I and II. The soils in this area are Grey Wooded, developed on saline bedrock with variable shallow sandy overlay. The solum is deeply leached. The Bt horizon has developed a hardpan, restricting water and root penetration. Tree growth on the bedrock is slightly stunted, bedrock with shallow alluvial overlay carries mature mixed forest. Agricultural expansion took place in this marginal area.

It is recommended to place this area in a conservation zone. (Mainly improved grazing.) (Total area 39 quarter sections of which 12 are Crown land - Yellow Zone.)

#### Problem Area II

The soil conditions in this area are similar to Problem Area I. However, development is farther advanced and the area is surrounded by agricultural lands. It is recommended that this area remains in the White Zone.

Problem Area III. This area is a mixture of shallow stony phase alluvial material and shallow organic soils. The shallow alluvium has a solid stone layer at the contact with the underlying till. Field inspection showed that breaking operations brought many stones to the surface. The stony-phase is usually rated non-arable. The shallow organic soils (low humic eluviated Gleysol) are only suitable for perennial forage production.

It is recommended to place this area in a conservation zone. (Total area 12 quarter sections of which 2 are Crown land - Yellow Zone.)

Problem Area IV. These soils developed on the fringe of the large deltaic deposit in Tp 76-R25 and R26. They are associated with the dune areas but have sufficient fine material in the profile to develop a sandy clay loam to sandy loam Bt horizon at 12 to 18" below the surface. These soils are very vulnerable to wind and water erosion. They are Grey Wooded and have low natural fertility.

It is recommended to place this area in the conservation zone. (Total area 17 quarter sections of which 8 are in the Green Zone and 9 in the Yellow Zone - all 9 are occupied.)

Problem Area V. This area is dominated by low humic eluviated gleysols with a very deep (8 to 10") Ae horizon and peaty meadow soils. In the first five years of development these soils are only suitable for feed crops. With increased aeration due to improved drainage and cultivation practices, coarse grain crops can be ripened.

It is recommended that the gleisolic soils which are under cultivation and areas of these soils surrounded by farmland will be used for farm consolidation. Area V in the northwest corner of Tp 73-R26 should be in a conservation zone. (18 quarter sections of which 7 are Crown land).

Problem Area VI. This area is a 'bedrock-high' with gently rolling and rolling topography. The area has dark grey solonetzic soils. Hardpan conditions combined with long slopes demand special cultivation practices due to their susceptibility to water erosion. The soils have the following agricultural ratings.

Valleyview series - generally fairly good arable soils (Dark-Grey) ARDA 3s

Kavanagh series - poor to fair arable soils (Black and Dark Grey) ARDA 4s

Debolt series - poor to fair arable soils (Grey Wooded) ARDA 4s

Teepee complex (podzolic and brunisolic - sandstone) - non arable to fair arable ARDA 4s

This area is wholly privately owned with the exception of one quarter section under long term grazing lease. It is suggested that tax recovery lands be seeded to permanent pasture. Conservation Zone is recommended.

Problem Area VII. The area north and west of the Smoky River has been under development since 1928. Patented land on the erosion slopes of the Smoky and its tributaries are found everywhere. This is a result of past land disposal policies or lack of them. Under new conservation rules, no development will take place on this type of land.

It is recommended that, on a long term basis, the Crown acquire these lands for placing in the Conservation Zone.

#### Observations

Cropped Land: a. plow layer is light grey in colour and silty to sandy in texture. The Bt horizon is high in clay and acts as a hardpan.

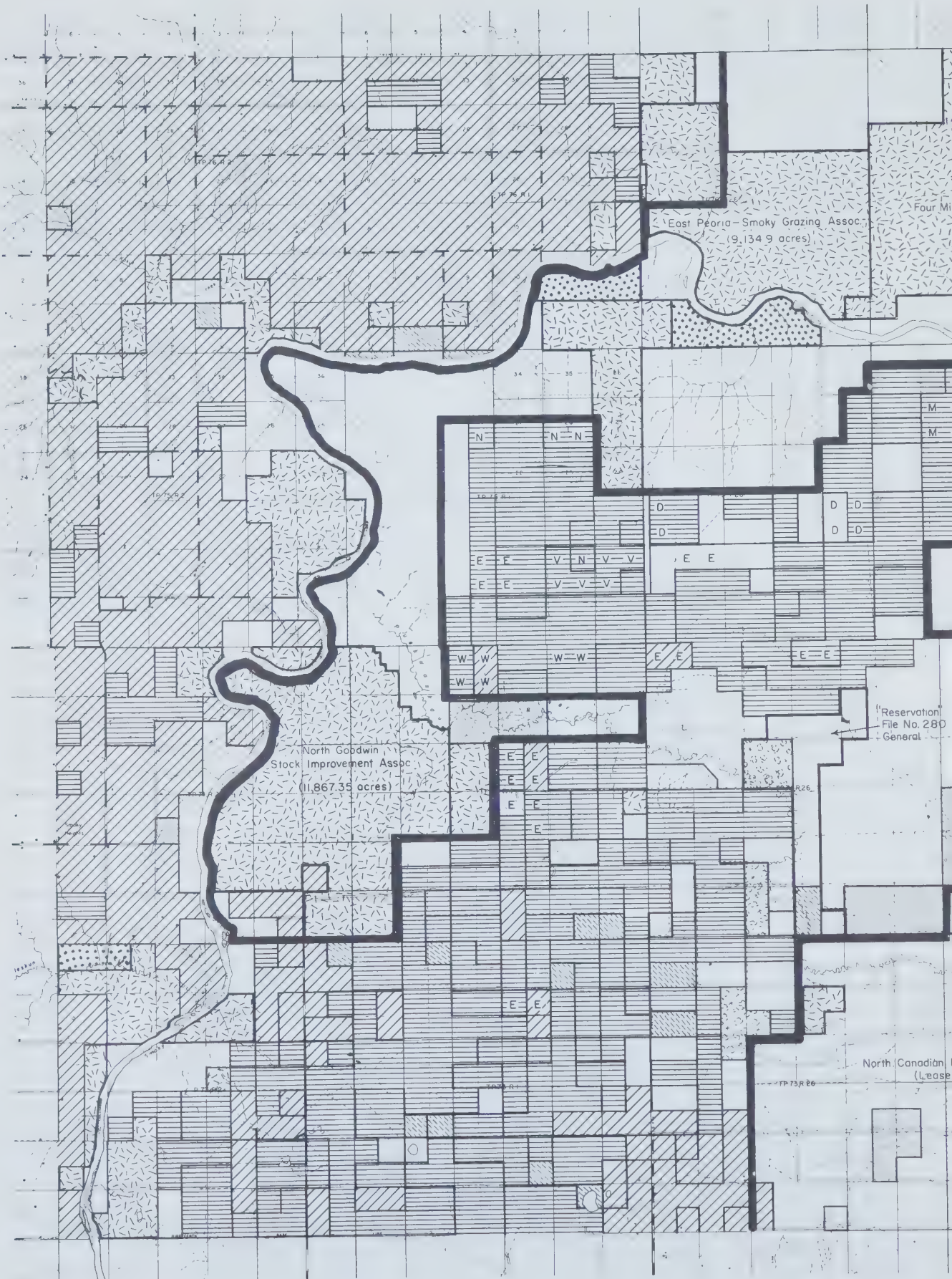
b. surface crusting after rain, preventing germination in spring.

c. water saturated Ae horizons create cultivation problems.

d. the cleavage faces in the Bt horizons of lacustrine soils are many and allow rain and roots to penetrate the Bt. In the deeper leached residual soils, the cleavage faces are narrow and swelling clay particles will clog them. The resulting saturation of the Ae horizon creates a condition called 'quick-sand' by local farmers.







R.2

R.1

R.26

WEST of 6th

WEST of



# PUSKWASKAU



## LAND DISPOSITION AND OWNERSHIP MAP

- Patented land
- Homestead lease or sale, Agriculture farm sale, Veteran homestead lease or sale, etc.
- Cultivation lease or permit
- Reserved for Forestry, Fish and Wildlife, Watershed protection, etc.
- Reserved timber commercial and miscellaneous timber permits
- Present Green Zone boundary
- Grazing Lease
- Grazing Permit

Land status as of 11/9/69

Farm holdings north of Puskwaskau river as of spring 1969

Farm holdings formed as a unit - E-D-M-N-V-W

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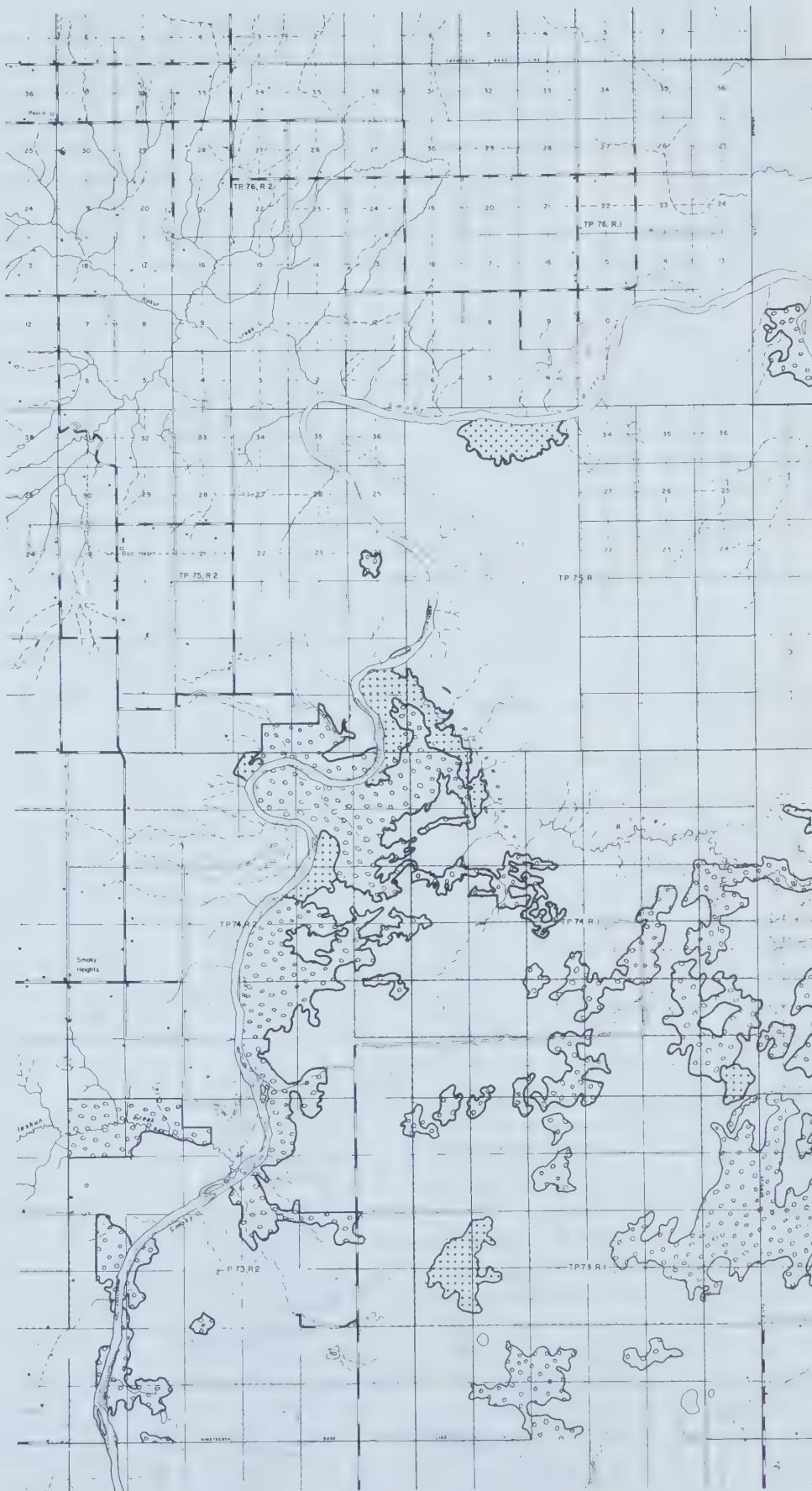
Study prepared by C. Van Waas

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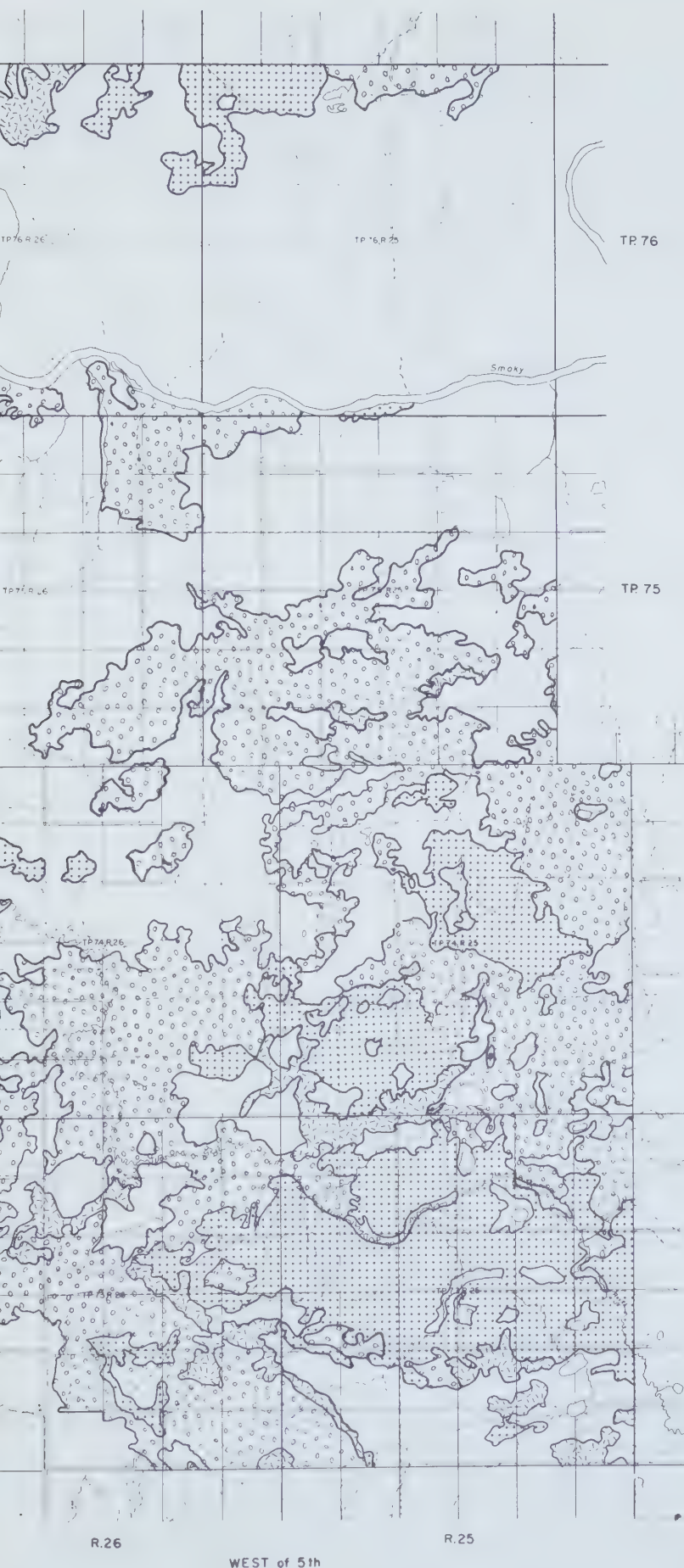




R.2

R.1




WEST of 6th



# PUSKWASKAU



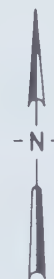
## FORESTRY

-  Deciduous mature forest
-  Coniferous mature forest
-  Mixed deciduous and coniferous mature forest

Forest cover from aerial photographs taken in 1945 and 1952

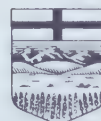
Height class 2 areas (31-60 feet) have been updated to height class 3 (61-80 feet)

Height class 3 and 4 (81 feet and over) have been combined



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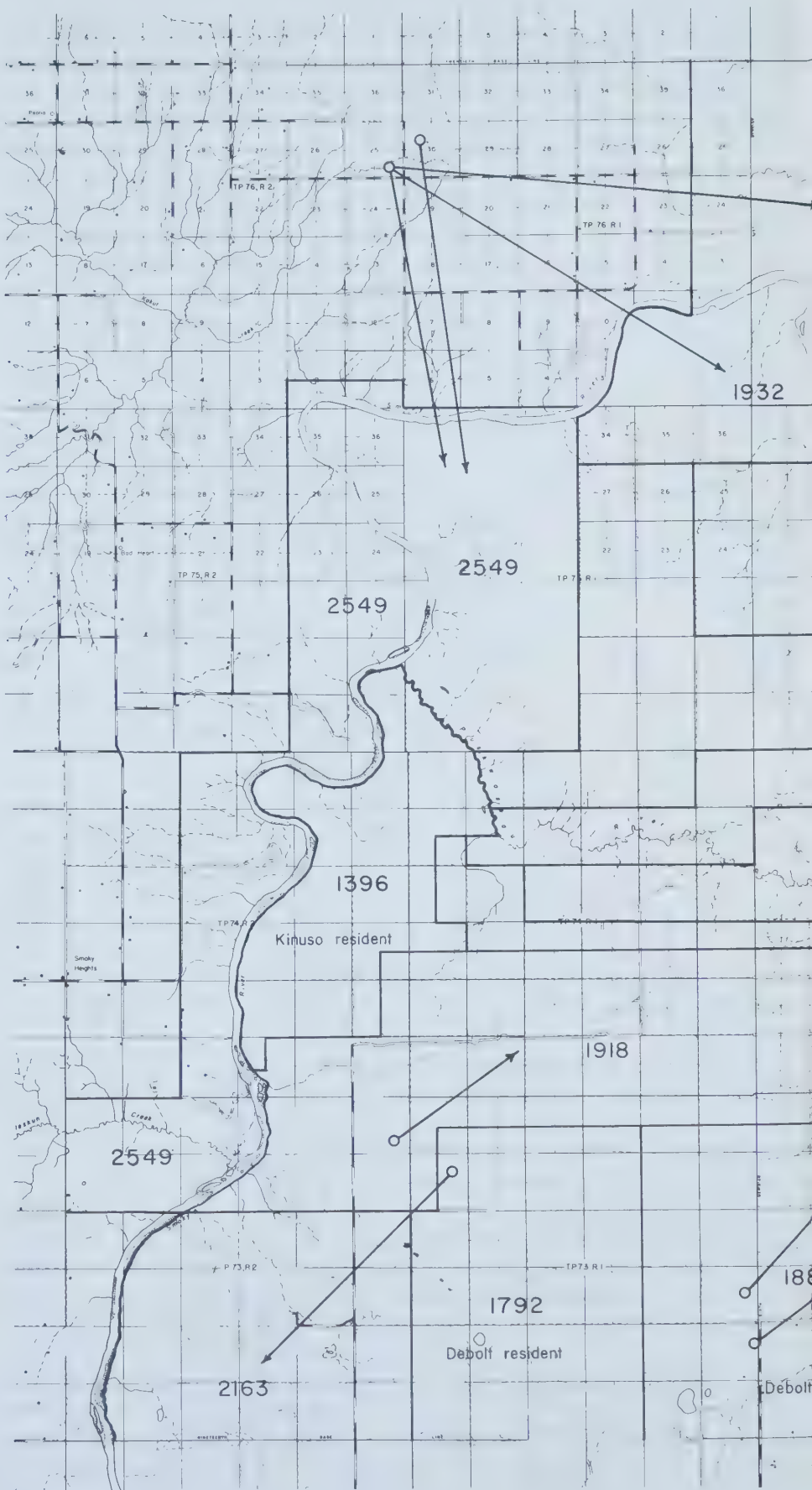


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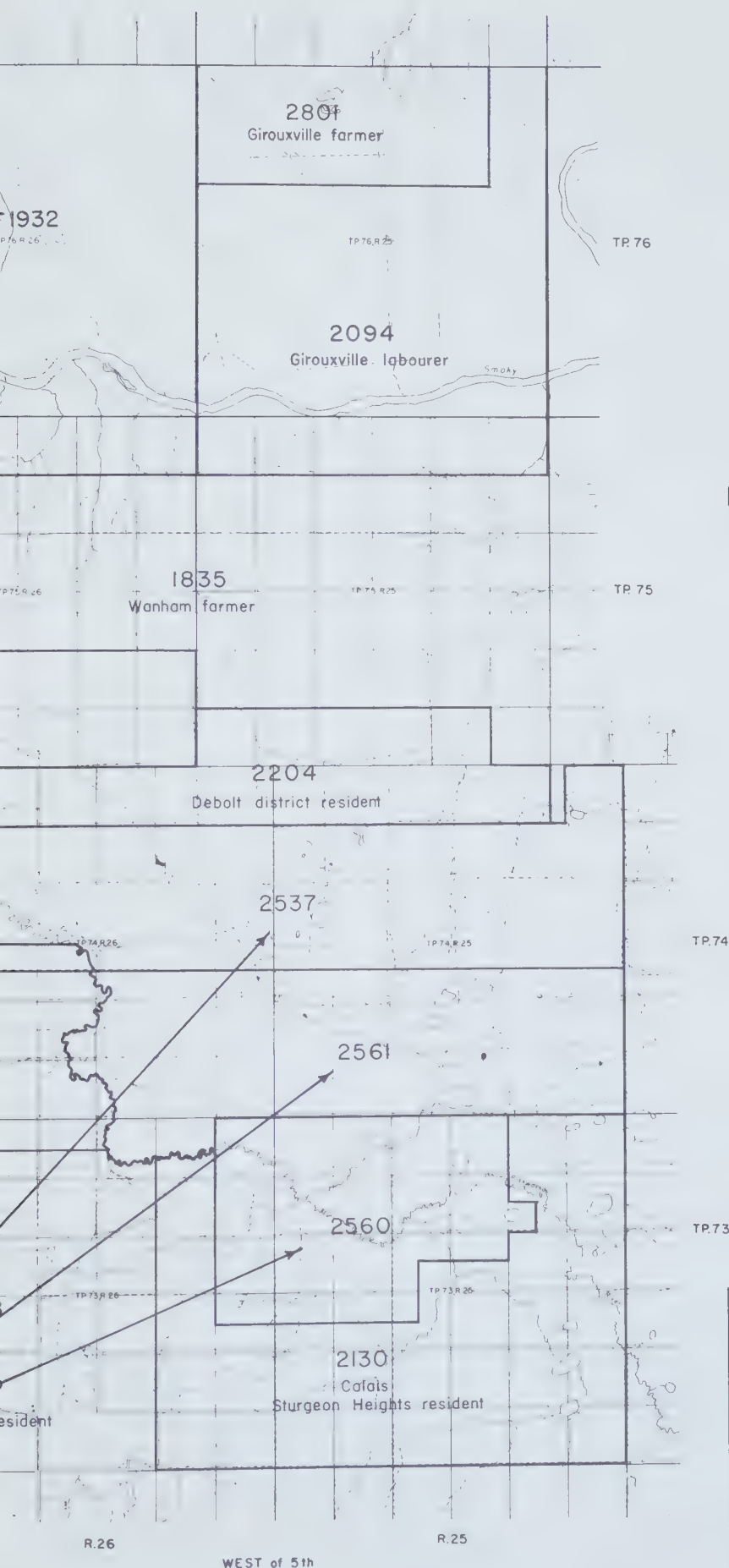




R.2

WEST of 6th

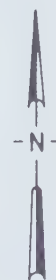
R.1



## PUSKWASKAU

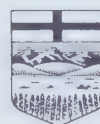


### REGISTERED TRAP LINES AND DOMICILE OF LICENSE HOLDERS



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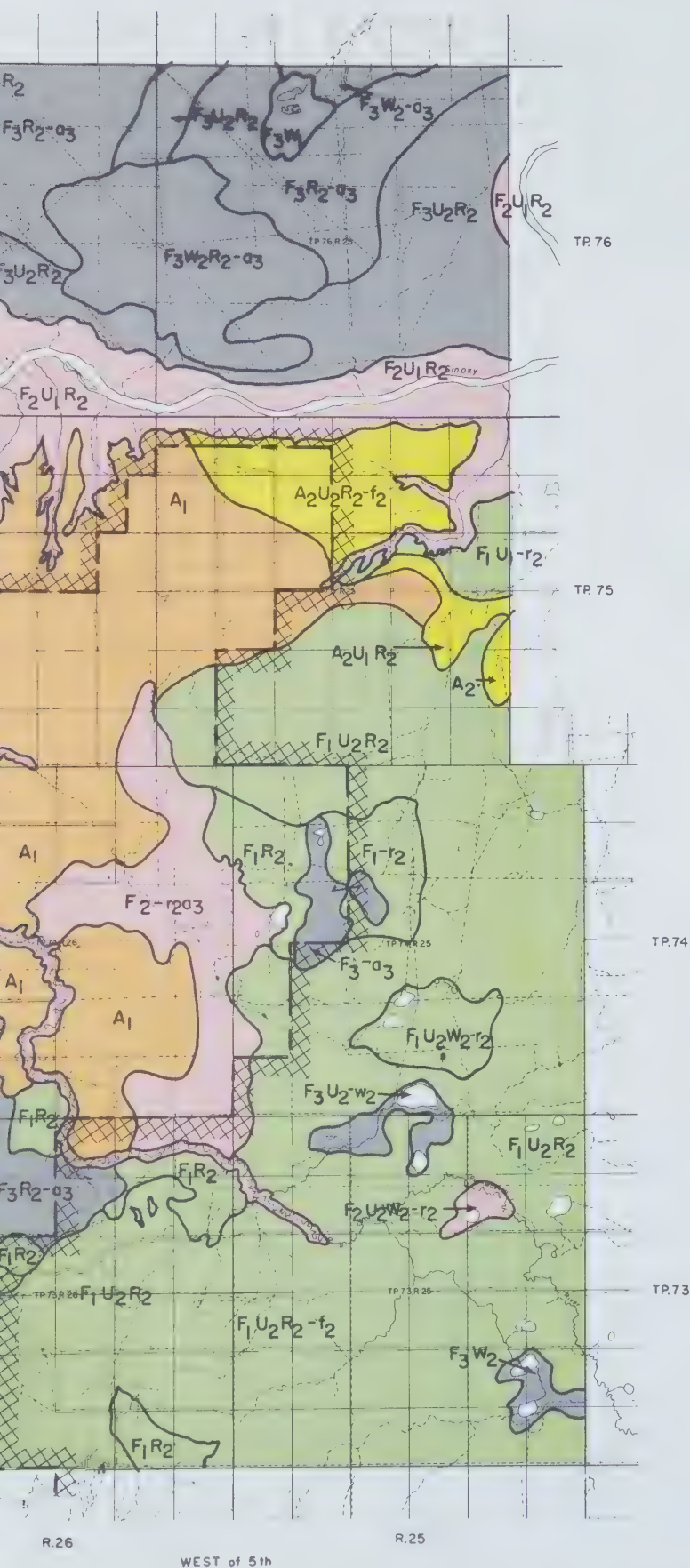
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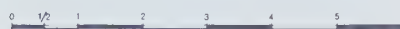
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## PUSKWASKAU



### LAND USE CODING MAP

#### AGRICULTURAL

A<sub>1</sub>A<sub>2</sub>A<sub>3</sub>

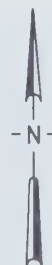
#### FORESTRY

F<sub>1</sub>F<sub>2</sub>F<sub>3</sub>

Map coloured on the basis of dominant class.



Green Zone Boundary



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Forestry:                      Compatibility between growing trees and pasturing cattle will only be achieved through the means of improved pasture. That is low capability areas for tree growth within the forest may be better used for improved grazing. This will have a twofold result; a. increased carrying capacity, b. a minimum of browsing and trampling in the forest stands. Unimproved pasture is a misnomer. It means a tract of forest in which cattle are trying to find some forage. A carrying capacity of 60 or 100 acres per head per year, compared to 12 to 15 for improved pasture, shows the inefficiency of grazing in the forest.

Wildlife and Recreation:    The clearing of the Smoky River Plains for agriculture has resulted in a concentration of game in the River Valley. The importance of the river valleys for the maintenance of the ungulate population is paramount. It was observed that most of the settlers are dependent on wildlife for their meat supply. Co-operation in reserving the valleys for wildlife and recreation can be expected from the local population.

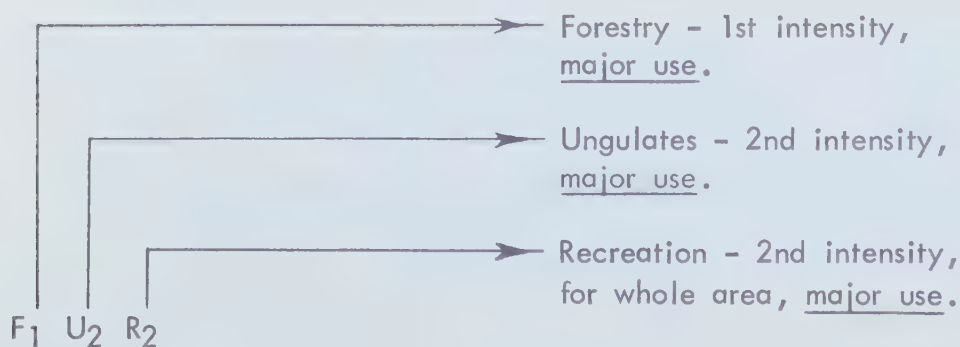
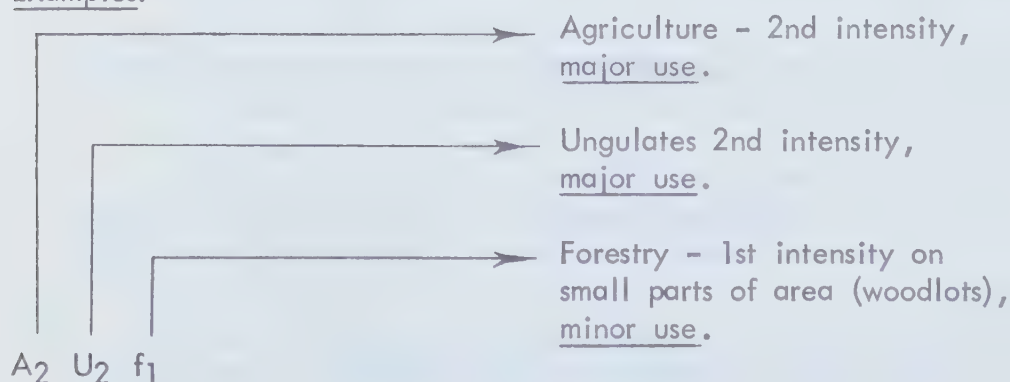
Grazing:                      Cattle like people are inclined to follow the road of least resistance. As a result all open areas (fence line clearings, seismic lines, open meadows) have a tendency to be overgrazed, while forage in the bush, if available, is not utilized. This is inefficient utilization of land. On river banks, this habit will lead to erosion problems.

## J - LAND USE CODING

The Land Use Coding System recognizes two groups of codes. One starting with A; indicating primarily agricultural use, the other starting with F, indicating non-agricultural use. Capital and lower case letters refer to major and minor use. Major use utilizes the complete unit, while minor use is of importance on part of a unit.

Intensity of potential use is indicated with three arabic numerals. Numeral 1, being the highest.

### Examples:





Use intensity ratings are as follows:

### Agriculture

- A<sub>1</sub> Land designated for agriculture, yearly cultivation and row-cropping. Generally capability classes 1, 2, and 3.
- A<sub>2</sub> Land designated for improved grazing on a multiple use basis. Other major and minor uses are to be accommodated to a degree consistent with good pasture management. Generally capability classes 4 and 5. Sale of such lands is only possible if a way can be found to restrict the use to the specified one.
- A<sub>3</sub> Land designated for unimproved grazing. This term is used here to mean grazing of natural meadows and openings in otherwise wooded lands, but also native range in the prairies. In the first example it is a minor use, in the second a major use. In each case the carrying capacity is shared on a predetermined basis with ungulates. Depending on the share allotted to domestic grazing, improvement of natural grasslands can be considered. Generally capability classes 5 and 6.

### Forestry

- F<sub>1</sub> Permanent production forest land for which the major use is the growing of commercial wood products, capability classes 3 to 5 inclusive.
- F<sub>2</sub> Protection forest land. Lands on which forests are grown primarily to maintain or improve the lands for other uses, such as water regulation, erosion control, wildlife and recreation. F<sub>2</sub> lands are generally capability 3 to 5 inclusive land, which therefore can produce commercial wood products.

Timber production however is incidental to the primary objective, namely the provision of optimum protection of the land for other uses.

The F<sub>2</sub> designation and the F<sub>3</sub> designation described hereunder are proposed to indicate the importance of the land for the quantity, quality and timing of water and should be viewed as interdependent forest and water uses.

All lands with F<sub>2</sub> and F<sub>3</sub> designation require management consultation with the Water Resources Division of the Department of Agriculture.

- F<sub>3</sub> Protection forest land. Lands covered with natural vegetation of any type, which is grown to maintain or improve the lands for other uses, such as water regulation, erosion control, wildlife and recreation. F<sub>3</sub> lands are generally capability 5 to 7 inclusive lands, which are very marginal to non-productive for timber. Some of these lands can occasionally supply utility wood products such as fenceposts and rails.

### Ungulates

- U<sub>1</sub> Lands of capability 1, 1W, 2 and 2W, which are designated to intensive use by ungulates.
- U<sub>2</sub> Lands of capability 3 and 4, designated to moderately intensive use by ungulates.
- U<sub>3</sub> Lands of capability 5, 6, and 7 designated for extensive or dispersed use. This designation is not used because it is considered low potential and is shown as F<sub>3</sub>.

### Recreation

- R<sub>1</sub> Generally lands of capability 1, 2 and 3 designated for intensive recreational use.
- R<sub>2</sub> Generally lands of capability 4 and 5, designated for moderately intensive use.
- R<sub>3</sub> Generally lands of capability 6 and 7, designated for extensive or dispersed use. This designation is not used because it is considered low potential and is shown as F<sub>3</sub>.

### Waterfowl

- W<sub>1</sub> Generally lands of capability 1, 1S, 2, 2S and 3S for waterfowl designated for intensive use.
- W<sub>2</sub> Generally lands of capability 3, 3M and 4 designated for moderately intensive use.
- W<sub>3</sub> Generally lands of capability 5, 6 and 7, designated for extensive or dispersed use. This designation is not used because it is considered low potential and is shown as F<sub>3</sub>.

### Recapitulating the explanation of the Land Use Code:

- a) The code indicates preferred land use for a given area. Agreement on management responsibility is necessary for each code before an area is allocated to the White or Green Zone.
- b) Water Resources interests are tied to codes which start with a F<sub>2</sub> or F<sub>3</sub> letter. Small streams in codes starting with A<sub>1</sub> are protected by existing water course agreement policies.
- c) Lands coded for non-agricultural use, but which offer opportunity for agricultural expansion will have a time limit added to the code: eg. F<sub>1</sub><sup>20</sup>. A minimum of 20 years is suggested, as this time limit coincides with length of forest management and longterm grazing leases.

## K - RECOMMENDATIONS

1. The upward movement of creek ravines tributary to the Smoky River should be minimized. This can be achieved by placing affected areas in the Conservation Zone.

Reasons:

- a. Elevation difference between upland and valley floor of the Smoky River is 500 feet. This drop will accelerate run off greatly.
- b. The lacustrine mantle is shallow and the underlying geological formation highly erodable.
- c. Existing conservation rules are difficult to enforce when these lands are transferred to private ownership.

2. Areas with heavy tree cover on arable soils should remain in the natural state until agricultural development is economic. Lands should not be developed until all merchantable tree species are harvested at maturity (full rotation age).

3. The following ARDA class 4 Agriculture soils should be withheld from settlement. In the study area these soils are in the lower category of Class 4 and are classified in the following soil subgroups:

1. Gray Solonetz to gray solod; residual (Debolt series) (poor internal drainage and hardpan, low fertility).
2. Gray Wooded; sands and silts (Culp series) (excessive drainage, low fertility, vulnerability to wind erosion).
3. Gray Wooded; tills with sandy overlays or adverse topography (low fertility, vulnerability to water and wind erosion) (Braeburn and Cadesa series).
4. Low Humic Eluviated Gleysol; (Snipe series) (depressional cold soils with an organic surface layer of less than 12").

Reasons: These areas have a heavy tree cover. The Gleysols have a mixture of willow, black spruce, dwarf birch and black poplar and are poorly drained soils.



It was observed that in comparison to the Edmonton area, like soils carried the same rating. This does not appear to be right considering climatic conditions. The present agricultural situation is, to a degree, considered in this recommendation.

4. Settlers on a combination of low fertility - heavy tree cover soils should have the option to relocate (Twp 73-R1 and R26-W5).

- Reasons:
- a. Required high capital investment is not available.
  - b. Low fertility soils require above average management skills.
  - c. The necessity to require capital by working off the farm is not conducive to good management.
  - d. Tenants are behind in their duties.
  - e. Class 3 soils with light cover are available in Twp 74-R1 and R26-W5.

5. Water supplies are mainly dependent upon spring run off due to poor quality of water found in drilled wells. Before settlement takes place, further investigations are required to insure that adequate water supplies can be developed. At present difficulties are encountered in changing from dry land farming to a cattle enterprise due to inadequate water supply.

6. It is recommended that some aspects of current grazing policies be reviewed.

- Reasons:
- a. The economics of grazing in wooded areas is adversely affected by the high cost of fencing, sparse forage growth under tree canopy and low forage quality.
  - b. Grazing improvement of wooded lands with a designated agricultural priority will aid the development towards a livestock orientated farming industry. Development should be encouraged in order to increase carrying capacity. Increased carrying capacity of these lands will serve to reduce demands for grazing on wooded lands with a forestry or wildlife priority.
  - c. Agricultural soils (ARDA Class 3 and 4) should be considered for permanent pasture development.

7. It is recommended that the Crown retains scattered quarter sections in relatively homogeneous agricultural areas.

Reasons:

- a. Will moderate climate (windbreak).
- b. Provide habitat for wildlife (upland birds and deer).
- c. Can be utilized as community woodlot on a sustained yield basis.
- d. Will improve the aesthetics of the region.

8. In the study area a combination of ARDA rating 4 Forestry with ARDA 3 Ungulates (summer range) should be managed for Forestry and Ungulates if the ARDA Agriculture rating is 4 or lower.

Reasons:

- a. Class 4 Forestry is the dominant productive class in Alberta.
- b. Ungulates attract many non-resident hunters during the hunting season.

9. Upland areas (Topographic highs) should remain under forest cover.

Reasons:

- a. Insufficient hydrological data is available to evaluate surface and subsurface water movement.
- b. Shading effect of forest cover will slow down spring run off.
- c. Retarded spring run off will greatly prevent flooding conditions at the base of the uplands and aid tree growth on the upland.
- d. Retarded spring run off will aid infiltration and bolster subsurface water supplies.
- e. Forest cover will aid in regulating streamflow which in parts of the area provide a domestic water supply during early summer.
- f. Uplands have frequent bedrock outcrops.
- g. Uplands have longer growing season but lower average daytime temperatures. Grain crops will not mature. The longer frost free period does not make up for the cooler temperatures. (unpublished information . A.C.Carder-Canada Department of Agriculture, Research Branch, Beaverlodge.)
- h. Forested areas will provide winter employment.
- i. The occurrence of alluvial overlays on the upland regions indicate highly productive forest sites.

L. The Land Use Assignment Committee has reviewed the Puskwaskau Land Use Study and submits the following recommendations:

1. It is recommended that the areas designated for watershed protection as shown on the Water Resource Management Map should be managed primarily to maintain the natural watershed.
  2. It is recommended that grazing of domestic livestock in the watershed protection area be phased out.  
The capability of other uses such as watershed, wildlife, forestry and recreation, is consistently higher than that of agriculture.\*
  3. It is recommended that grazing in wooded areas be discontinued.
  4. The Department of Lands & Forests disposes of land in units of one quarter section for agricultural purposes. Many purchasers are utilizing only part of their land and are earning the major portion of their income from off farm employment.  
Such purchasers on arable land keep it out of full production, while full time farmers require additional land to develop viable units.  
Such purchasers on marginal lands are forced to bring their land into production under adverse economic conditions and against their personal inclination.  
This situation creates financial hardship on the individual and places a strain on administrative and social services.  
  
It is therefore recommended that the government review present land sale policies so as to formally recognize the need for the designation of land areas for rural living use. The review should include all related factors such as land capability, regional planning, transportation, utilities, health and educational services.
  5. Water supplies are mainly dependent upon spring run off due to the poor quality of water found in drilled wells. At present difficulties are encountered in changing from dry land farming to a cattle enterprise due to inadequate water supply.  
  
It is recommended that before settlement takes place further investigations be made to insure that adequate water supplies can be developed.
- \* One member voted against Recommendation No. 2 because he felt some river terraces and flood plains in the area may have limited grazing use, on a planned, integrated basis with other uses. This planned use of grazing would still maintain the natural watershed. Further, there are existing floodplains presently being farmed for which, if revested, the major use would likely be grazing.



6. Lands exhibiting similar capability for two or more uses and which are producing a resource or resources now should not necessarily be committed to any use for the planning period.

It is recommended that a category of land be recognized where use is not restricted to "commodity use" but includes non-consumptive use or non-use.

7. It is recommended that the following categories of land be considered for purchase under the Land Assembly Program.

- 1) Those lands designated as watershed protection lands.
- 2) Lands with a combination of marginal soils and heavy tree cover as outlined in Problem Area I.
- 3) Lands located in Problem Area IV. In the event that these lands revert to the Crown no disposition leading to title should be considered.

## M - METHODOLOGY

Canada Land Inventory maps were used throughout the planning process. Soil survey information and air photographs were used to evaluate areas of conflict.

The following maps were prepared from available information:

a) C. L. I. land classification for Agriculture, Forestry, Fish & Wildlife (ungulates, waterfowl), and Outdoor Recreation.

b) A detailed land capability analysis map was prepared by superimposing the five C. L. I. maps mentioned under point one. This map shows each unit with its complete rating. A - for Agriculture, F - for Forestry, U - for Ungulates, O - for Outdoor Recreation and W - for Waterfowl.

Each area was colored for its highest capability (lowest number), as follows:

Orange - agriculture  
Green - forestry and wildlife - ungulate  
Red - wildlife - waterfowl  
Grey - low potential for all uses

c) The final map is an adaptation of the detailed land capability analysis map to existing conditions. (socio-economic factors)

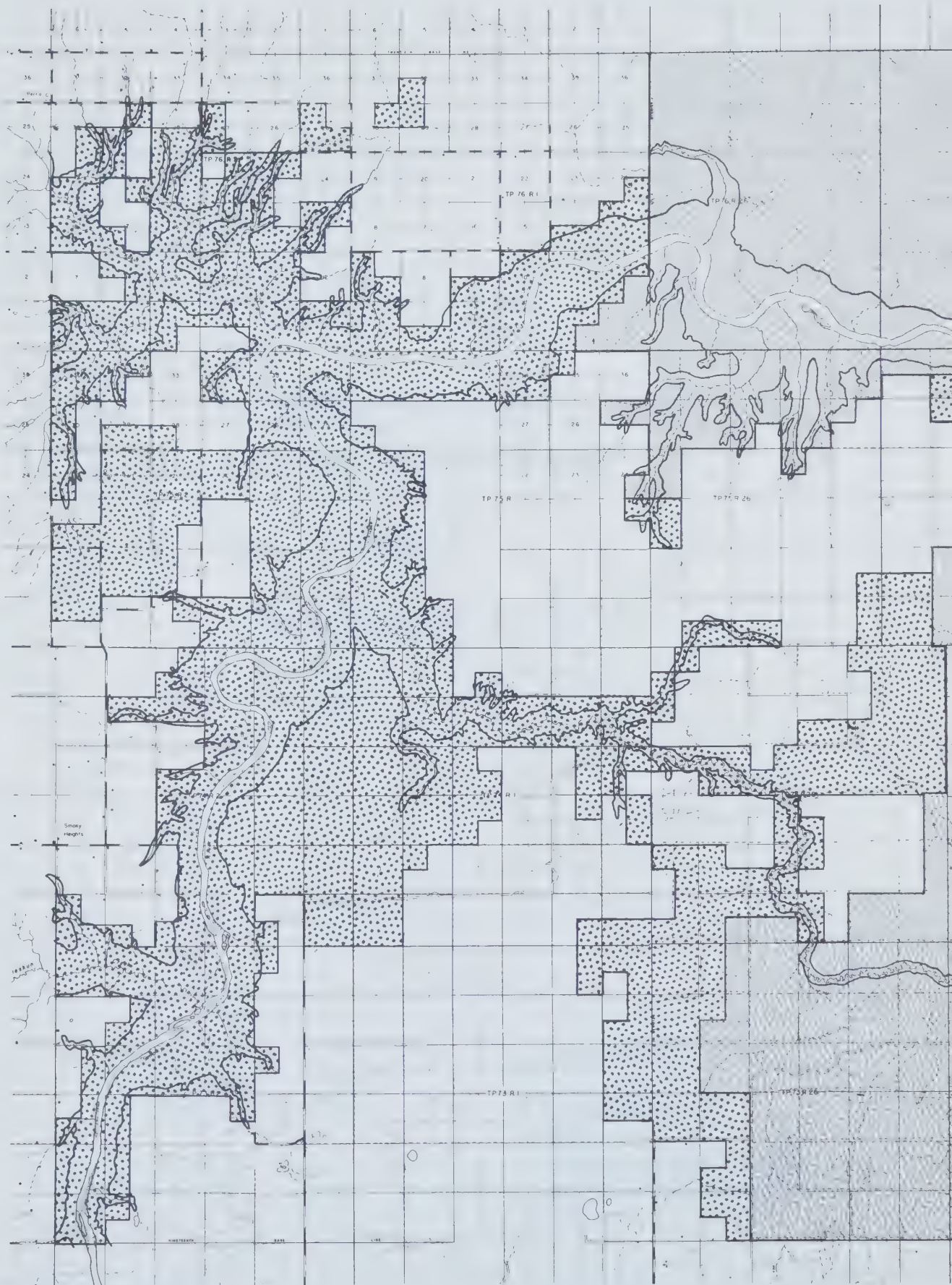
The area was traversed by helicopter with Mr. Bill Robertson of the Grande Prairie Land Office and Mr. Mike Romaine of the Forestry Land Use Office, Edmonton. The Beaverlodge Experimental Farm was visited to discuss problem soils with the pedologist, Mr. Arnold Henning. After obtaining additional field information and conducting farmer interviews, the area was revisited with Mr. Lorne Yule, Land Use Specialist of the Lands Division.

NOTE: The writer discussed the problem areas with Mr. Wm Odynsky, Chief Pedologist, Alberta Soil Survey, Research Council of Alberta. The ARDA agricultural ratings are based on soil survey report No. 15 and 18. The field work of report No. 15 was conducted during the summer of 1945-1946-1947, while the field work for report No. 18 started in 1950 and was completed in 1954. Accessibility at the time was poor and extensive use was made of packhorses. The problem areas will be checked during the summer of 1970, time permitting, by the Alberta Soil Survey. This may result in changes in ARDA agricultural ratings for some of these areas.









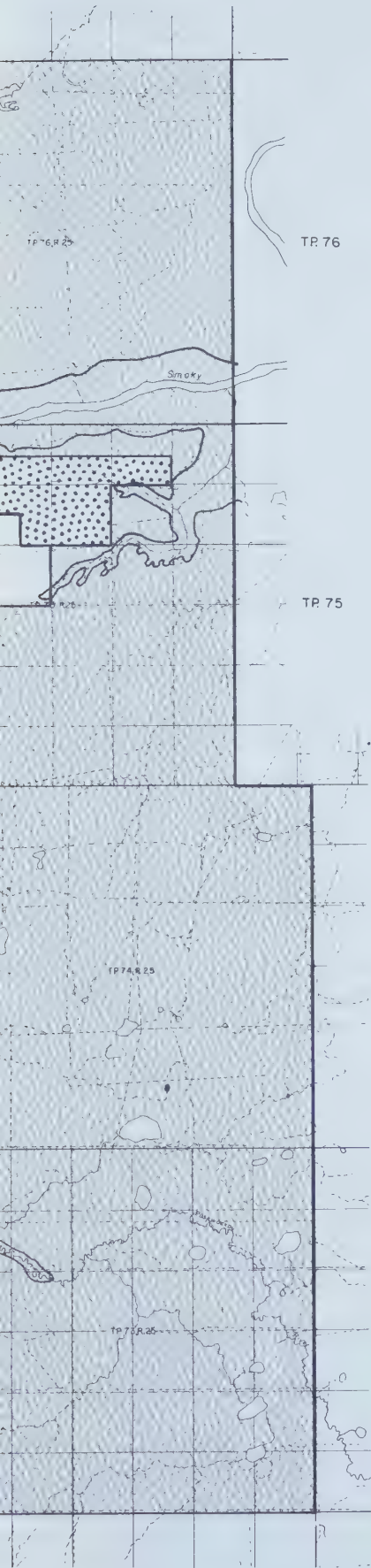
R.2

R.1

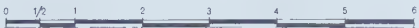
R.26

WEST of 6th




WEST of

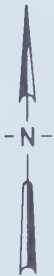


# PUSKWASKAU



## ZONING

- .....YELLOW ZONE
- .....CONSERVATION LANDS
- .....GREEN ZONE



NOTE:  
This map is comprised of portions of Alberta Base Maps 83-N-N.W./S.W. and 83-M-N.E./S.E.. Therefore all symbolization is standard for Alberta Base Maps



Department of Lands and Forests  
Technical Division  
Land Use Assignment Section

Study prepared by C. Van Waas

Preliminary..... Finalized ✓





PUSKWASKAU STUDY AREA  
WATER RESOURCE MANAGEMENT

Prepared for

Land Use Assignment Committee

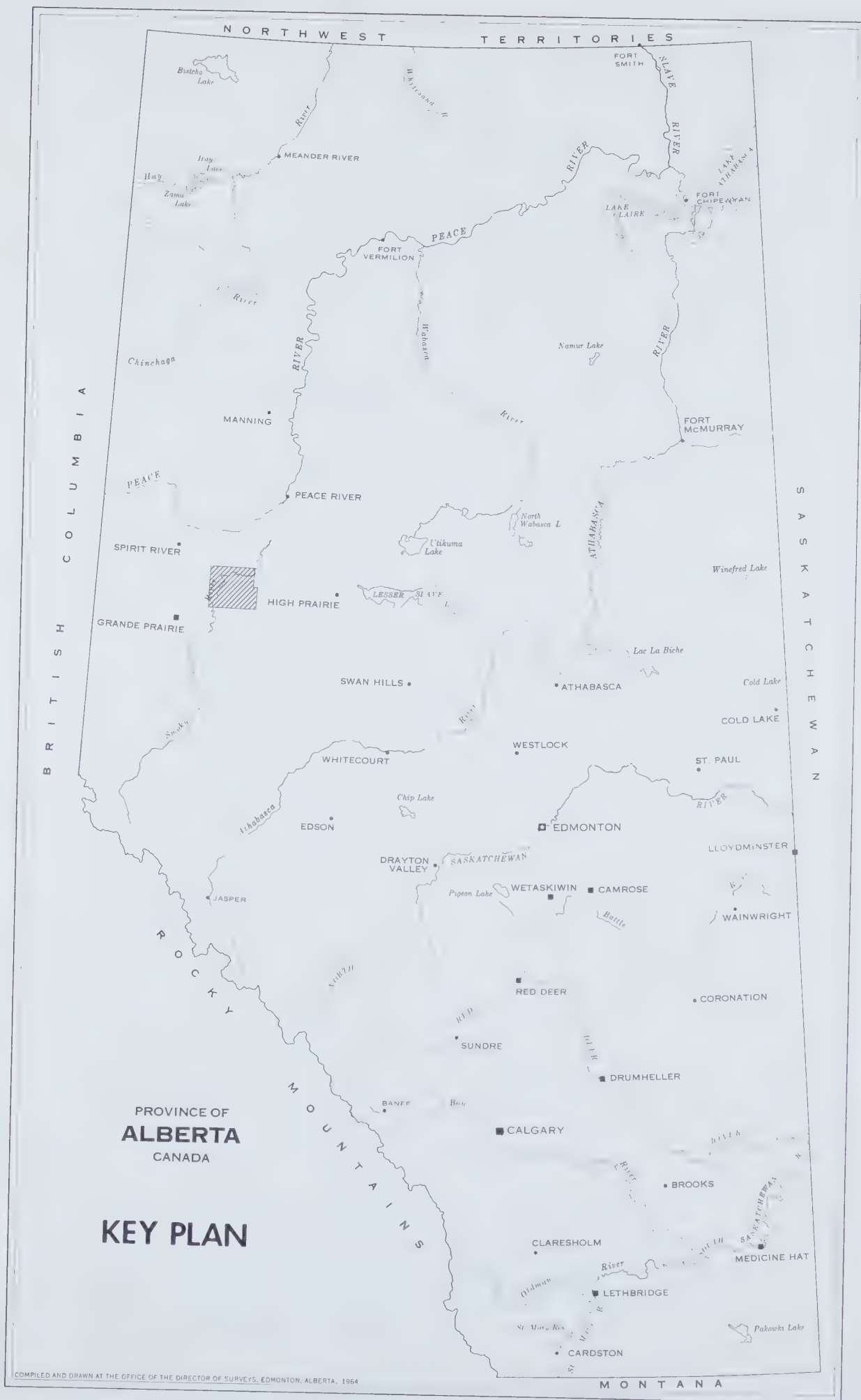
Department of Lands and Forests

Submitted By:

R. E. Bailey  
Director  
Water Resources Division  
Department of Agriculture









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## PUSKWASKAU STUDY AREA

### Water Resource Management Summary

The center of the Study Area is located approximately 35 miles northeast of Grande Prairie with the Smoky River forming the northerly and westerly boundaries. The Study Area lies in the area bounded by townships 73 to 76 and range 25 west of the fifth meridian to range 2 west of the sixth meridian.

#### Climate

Future agricultural production from this area will depend on several features of which climate is one of the most important but difficult to predict. Climate provides the conditions required for growth and establishes the upper and lower limits for growth. A number of factors produce local variations in climate (elevation, aspect, patterns of air drainage and land forms) and these microclimates can prove very important in the agricultural development of an area because these produce patches of both better than and poorer than average growing conditions.

Several organizations have prepared general agricultural ratings for the Province of Alberta. Within the Study Area the Alberta Research Council<sup>1</sup> has indicated that precipitation is usually adequate but wheat has suffered some frost damage in approximately 30 percent of the years. The frost free period has averaged 75 to 80 days. The Canada Land Inventory<sup>2</sup> specifies a similar frost free period but feels that an average moisture deficit of 3-5 inches can be expected.

<sup>1</sup> Agro-Climatic Areas of Alberta, 1967. W.E. Bowser and Alberta Soil Survey.

<sup>2</sup> Canada Land Inventory. Report No. 3, 1966. Department of Forestry and Rural Development Canada.

To look at actual climatic conditions found in and around the Puskwaskau study area it is necessary to refer to the Meteorological Summaries<sup>3</sup>. The stations of most interest were: Puskwaskau Tower (located in the study area), Codesa Tower (located a few miles north of study area), Falher (located in an agricultural area, east of study area), and Wanham (Canadian Department of Agriculture station west of the study area).

In general grass growth can be expected to start around the end of April and continue into the early part of October. During this period a frost free period of 75 to 90 days with temperatures in excess of 32°F can be expected. Between 1964 and 1969 (period of available data), only one year at either Codesa or Puskwaskau tower had a frost free period of less than 90 days. Data is obtained from a Stevenson screen at standard elevation; hence, ground frost may occur but not be recorded. Since many crops are not seriously damaged until temperatures reach 28°F the actual period available to plants for maturation will be in excess of the frost free period.

The Canada Land Inventory indicates that most of the Peace River Area will receive approximately 2000 degree days over 42°F per annum. This in many areas is considered the least number of degree days over 42°F that will permit commercial wheat production. This index (degree days over 42°F) does not consider day length so it is possible that the longer days found in this area will reduce the number of degree days over 42°F required for wheat production. It is important to note that the number of degree days over 42°F will vary from year to year.

<sup>3</sup> Monthly Records, Meteorological Observation 1969-1960. Meteorological Branch Department of Transport.



In general, both Puskwaskau and Codesa Towers show a lower maximum daily and mean daily temperature than the other stations considered. This difference appears to be in the order of 1 to 2°F per day but indicates a 5 to 10% reduction in the number of degree days over 42°F. The main reason for the change is likely elevation but the station location may also be biased. These lower daily temperatures could affect the rate of various non-enzymatic chemical reactions and thus reduce plant growth rate to some extent.

In the past 10 years (1960-1969) the study area appears to have received a greater amount of precipitation almost every year than the surrounding agricultural areas. This difference has often been as great as 2 or 3 inches over the May to September period. The estimated potential evapotranspiration for the area will approach an average of 20 inches per annum. If the study area has lower daily temperature, it will also have slightly lower potential evapotranspiration. This lower potential evapotranspiration and slightly higher precipitation will combine to reduce the level of moisture deficit found in the area. Laycock<sup>4</sup> has predicted that the moisture deficit will be as great as 8 inches one year out of 4 and as low as 2 inches in one year out of 4. Within the study area moisture deficits should not reach this level and will result mainly from poorly distributed rainfall. Also, during the past ten years (1960-1969) moisture surpluses occurred on at least two occasions when they would have interfered with agricultural operations.

<sup>4</sup> Water Deficiency and surplus patterns in the Prairie Provinces, 1967  
A. H. Laycock.

## Agricultural Significance of the Climate of the Puskwaskau Study Area

The future agricultural value of the area will exceed that of the surrounding vicinity in some aspects but will be lower in other aspects. Growing season rainfall will decrease from the forest tower (elevation 2750 approx.) but rainfall on the lacustrine plain (elevation 2000 - 2250) will exceed that found in Falher (elevation 1900) and Wanham (elevation 1950). The energy levels available for growth will be the greatest on the lacustrine plain and will decrease between 5 and 10 percent as the elevation increases to 2750 feet. This slightly lower available energy at greater elevations will reduce the rate of maturation of agricultural crops and increase the hazard of frost damage.

The area will not prove suitable for commercial wheat production but feed grain production will be feasible. The additional moisture during the growing season will aid in the establishment of forage crops for hay or seed production.

Future agriculture in this area should depend on livestock to consume a major portion of the areas agricultural production and avoid direct competition with areas more suitable for commercial grain production.

## GLOSSARY OF TERMS

Climate - The prevailing weather conditions of an area as determined by meteorological measurements made over a period of years.

Microclimate - The climate and its characteristics over a small area.

Frost free period - The period of time between the last spring frost (32°F or less) and first fall frost (32°F or less).

Killing frost - Any frost of sufficient severity to cause cessation of growth. A temperature of 28°F or less is considered sufficient to end the growth of most field crops.

Degree days over 42°F (growing degree days) - An index obtained by combining the length of the growing period with mean daily temperature to provide a cumulative measurement of the growing period. eg. mean temp. = 60°, 60-42 = 18 degree days.

Root Zone - The layer of soil in which plant root development will occur. Depth of this zone will vary but generally good agricultural soil will have a minimum of 3 or 4 feet of soil available for root development.

Soil moisture storage capacity - The amount of plant available moisture a soil can retain after gravitational drainage occurs. Generally it is measured in inches of moisture per foot of soil.



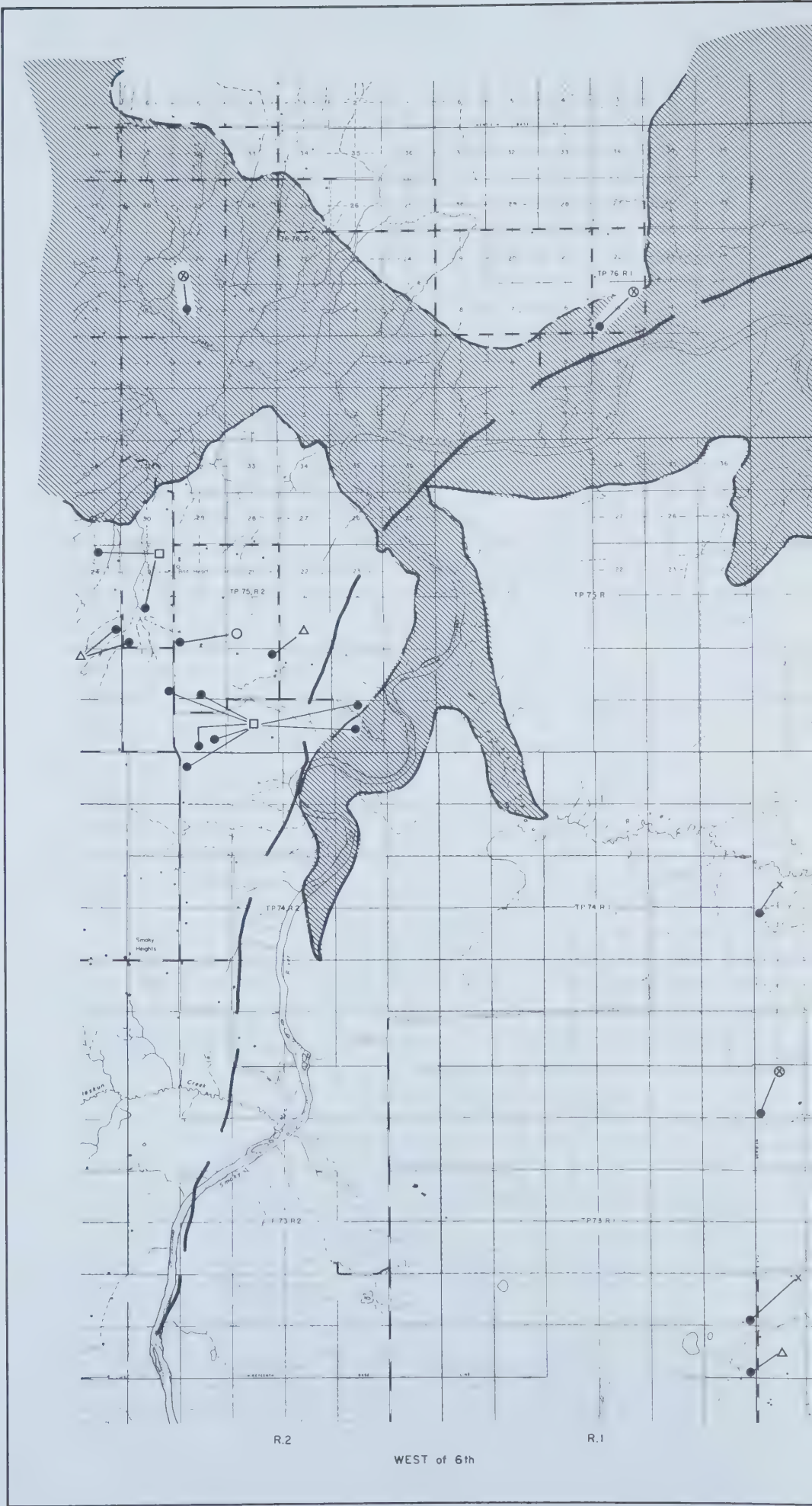
Plant available moisture - The moisture a plant can extract from a soil after gravitational drainage (1/3 Bar tension) and before the plant permanently wilts (15 Bar tension).

Moisture deficit - The difference between the amount of moisture available for consumption and the amount of moisture that could be consumed if it was available.

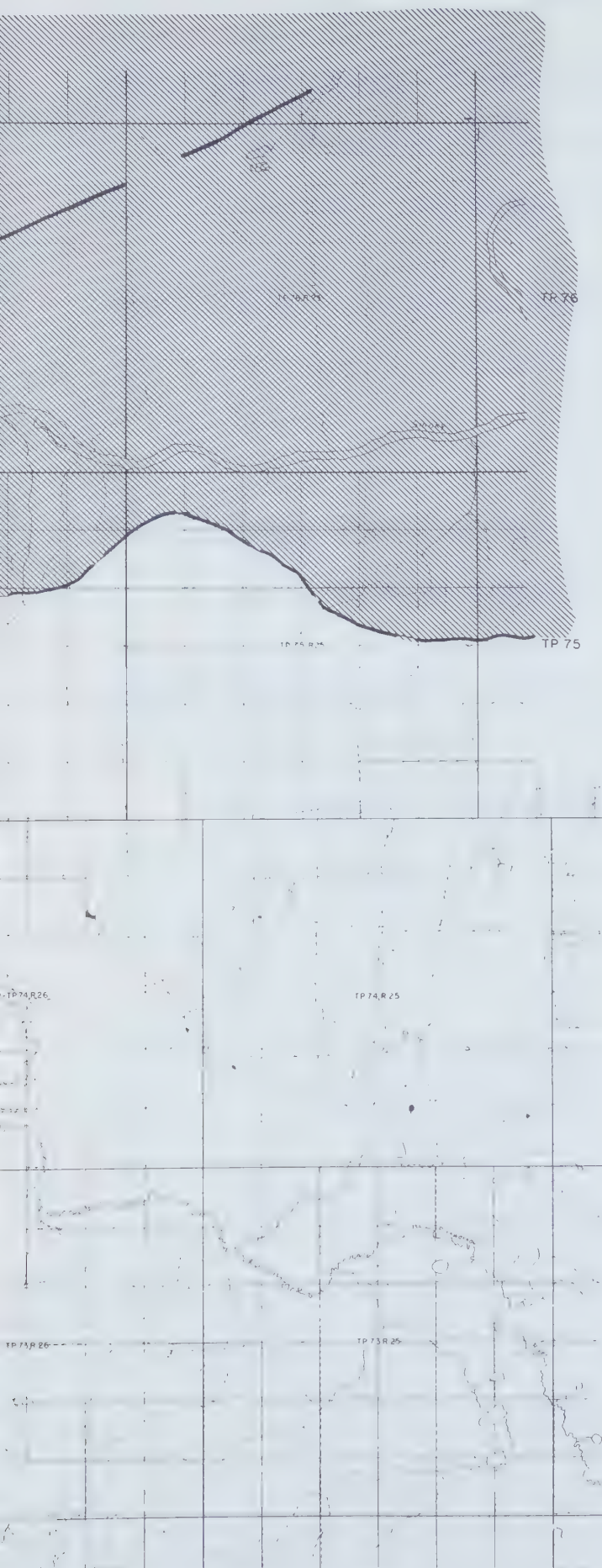
Moisture surplus - Moisture in excess of what can be consumed; therefore, can either be lost or stored for future use.

Potential Evapotranspiration - The amount of water used by evaporation from the soil and transpiration from the plants when there is a dense cover of vegetation and continuously moist soil. Simply, it is an estimate of water need.









## PUSKWASKAU

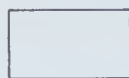


### LEGEND:

#### BEDROCK GEOLOGY



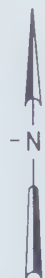
**PUSKWASKAU FORMATION**  
(DARK GREY SHALE; MARINE)



**WAPITI FORMATION**  
(NON-MARINE SANDSTONE, SHALE,  
COAL SEAMS)

#### BURIED CHANNEL DEPOSITS (INDEFINITE)

WELL LOCATION ----- •



Nonflowing well completed in:

SANDSTONE ----- Δ

COAL ----- ○

SAND & GRAVEL ----- □

UNKNOWN ----- x

DRIFT ----- ⊗

#### NOTE.

This map is comprised of portions of Alberta Base Maps 83-N-NW./SW. and 83-M-N.E./S.E.. Therefore all symbolization is standard for Alberta Base Maps



ALBERTA DEPARTMENT OF AGRICULTURE  
WATER RESOURCES DIVISION  
SOILS, GEOLOGY & GROUNDWATER  
BRANCH



### "GROUNDWATER AVAILABILITY"

FOR THE AREA INCLUDING

Tp. 73-76 ; R 25,26, W5th; R1,2, W6th.

Scale AS NOTED

Date APRIL / 70 FIGURE

Submitted by

Date

Approved by

Date

Designed by

Drawn by

Checked by

Date

File No. 12-L-817A-E1

R.26

WEST of 5th

R.25

### Comments and Recommendations

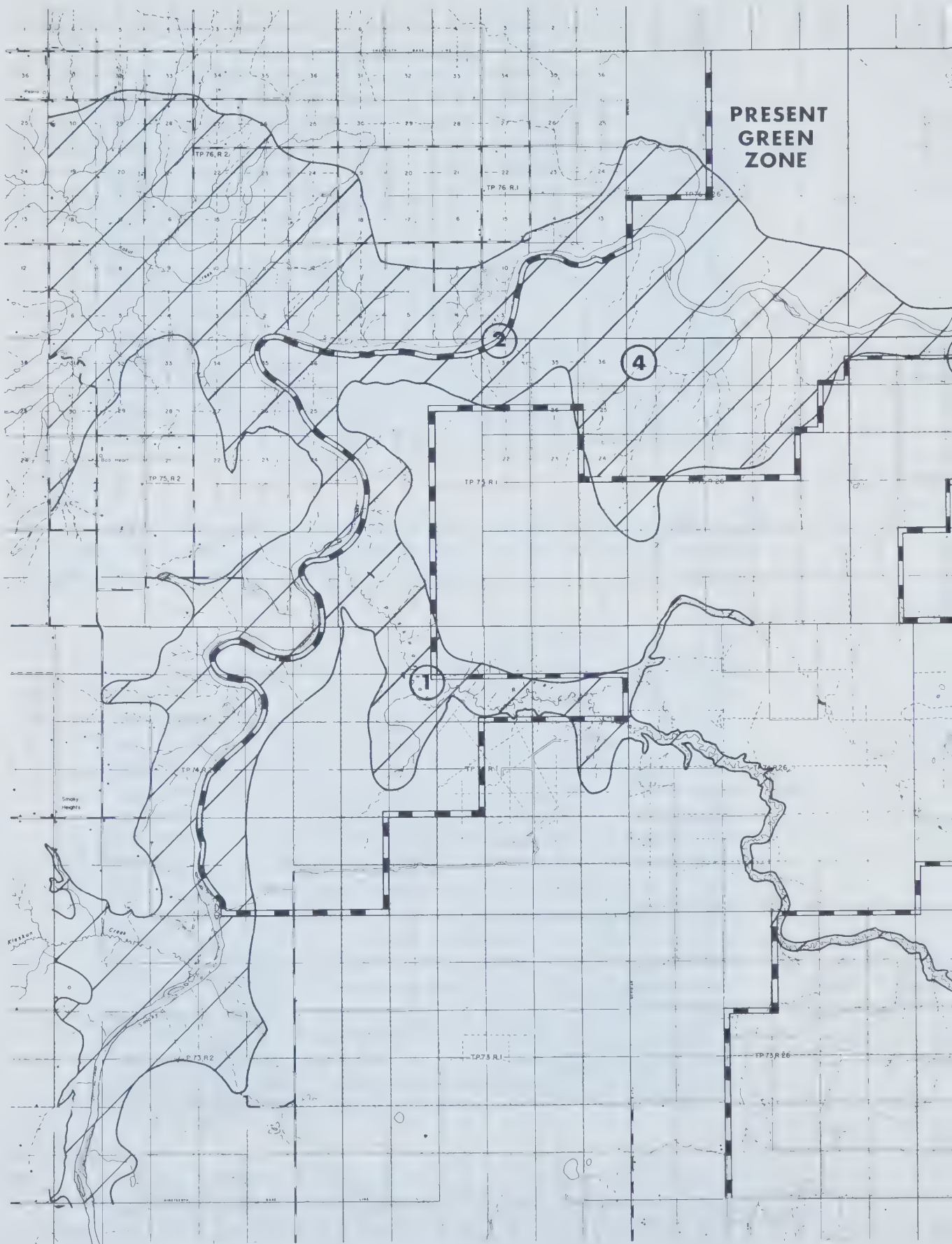
The watershed protection area is for the most part included in the brown or conservation zone. Areas that were not adequately protected have been enlarged on the Water Resource Management map (see map enclosed).

The area of primary concern is in township 75, range 26, south of the Smoky River where several tributaries enter. This could be a problem area under cultivation, in that erosion would be accelerated. The protection area was also adjusted into township 75, range 1 to provide a buffer zone near active slump areas.

A fairly intensive investigation was made of the river break zone in the map area. As a result it is recommended that the distance back from the top of the bank should not be less than three times the depth of the river valley.







**PRESENT  
GREEN  
ZONE**

R.2

R.1

R.26

WEST of 6th Meridian

WEST of 5th



# PUSKWASKAU

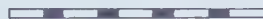


MAY, 1970

## WATER RESOURCE MANAGEMENT

### LEGEND:

PRESENT GREEN ZONE.



AREA RECOMMENDED FOR  
WATERSHED PROTECTION



LOCATION OF PHOTOGRAPHS SHOWN  
IN REPORT.

2

### NOTE:

WATER RESOURCE INFORMATION PREPARED BY; WATER  
RESOURCES DIVISION, DEPARTMENT OF AGRICULTURE.



### NOTE:

This map is comprised of portions of Alberta Base  
Maps 83-N-N.W./S.W. and 83-M-N.E./S.E.. Therefore  
all symbolization is standard for Alberta Base Maps









Fig. No. 1

Looking north on Puskwaskau River. Sec. 29, Twp. 74, Rg. 1, W6.  
Note poor clearing practice. No provision has been made for a buffer zone to prevent erosion on the river break.



Fig. No. 2

Looking west along Smoky River. Sec. 34, Twp. 75, Rg. 1, W6.  
This is a typical slumping problem in the area and has occurred where there is no agricultural development. Agricultural development in this area will only increase runoff and aggravate the slumping conditions.





Fig. No. 3

Looking north toward Smoky River. Sec. 33, Twp. 75, Rg. 25, W5. Note proximity of clearing to river bank. This would be the minimum distance recommended. Contour clearing would be advisable in these areas.



Fig. No. 4

Looking east along ravine in Sec. 32, Twp. 75, Rg. 26, W5. This area is dissected by numerous gullies and ravines and should be withheld from agricultural development.





